RAILROAD GAZETTE

FRIDAY, OCT. 17.

CONTENTS.

ILLUSTRATIONS:	PAGE.
The Calorimeter in Testing Locomotives	711
Ten-Wheel Express Locomotive—Wabash R. R. (*with inset*)	712
Clark Fisher Combination Rail Joint	715
Wear of Driving Tires Fitted with the Ross-Meehan Shoe.	715
Bonzano Steel Tie	716
Rails and Rail Fastenings	716
Safford Automatic Drawbar	717
Standard Snow Shed	718
The Transandine Railway	719
CONTRIBUTIONS:	
The Sykes Block Signal Apparatus	711
Division Superintendents' Salaries	711
EDITORIALS:	
Rate Making and Rate Maintenance	720
Black Hand and Barnesville Collision	721
Railroad Capital and Profits	721
New Form of Annual Reports	721
Annual Reports	722
EDITORIAL NOTES	720-722
New Publications	722
Trade Catalogues	722
GENERAL NEWS:	
Locomotive Building	725
Car Building	725
Bridge Building	725
Meetings and Announcements	725
Personal	725
Elections and Appointments	726
Railroad Construction	726
General Railroad News	728
Traffic	728
MISCELLANEOUS:	
Technical	723
The Scrap Heap	724
Steel-Tired Wheels and the Ross-Meehan Shoe—New England Railroad Club	718
Railroad and other matters in China	715
Railroads of Peru	715
Regulation of Interlocked Crossing Signals in Illinois	716
Semaphores and Interlocking	716
The Erie Trainmen's Demands	717
The International Meeting of Iron and Steel Men	722
New England Notes	723

Contributions.

The Sykes Block Signal Apparatus.

The Johnson Railroad Signal Company,
RAHWAY, N. J., Oct. 9, 1890.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of the 3d inst. is a description of the "Sykes Block Signal Apparatus." It is stated in this that the Union Switch & Signal Company has proprietary control of the Sykes system for this country. Permit me to say that the Johnson Railroad Signal Company claims the exclusive right to manufacture and sell the Sykes apparatus, and that it is now seeking to recover damages from the Union Switch & Signal Company for the manufacture and sale of this apparatus by a suit in equity in the United States Courts.

CHARLES R. JOHNSON, President.

Division Superintendents' Salaries.

Compania Limitada Del Ferrocarril Central Mexicano,
GUADALAJARA, Mex., Sept. 29, 1890.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your issue of Sept. 12 had an article relating to the increasing of salaries 50 per cent., etc., and relating especially to Division Superintendents and the salaries paid them.

In your issue of the 19th I note remarks from "General Manager," which I have read with interest; and in connection therewith, in the same issue, I find under the head of "Scrap Heap" the following:

"Five engineers on the C., C., C. & St. L. received $225 each as their pay for the month of August."

I would like to ask what pay the Division Superintendents on that system receive?

DIVISION SUPERINTENDENT.

The Calorimeter in Testing Locomotives.

BY GEORGE H. BARRUS.

I have been much interested in reading the editorial reviews on the tests of the Baldwin Compound Locomotive, which appeared in the *Railroad Gazette* Sept. 12 and in that of Sept. 19, 1890. The report has given all that needs to be said on my part in regard to most of the points discussed, with the exception, perhaps, of that part of the subject relating to the calorimeter tests. I would like to criticise what is said in the issue of Sept. 12 as to the arrangement of the calorimeter not being satisfactory, and to the suggestion which is thrown out that the difference in the economy of the two locomotives might be due to the difference in the dryness of the steam. The arrangement of the instrument, instead of being unsatisfactory, was in every way, at least to the writer, satisfactory, and the manner in which it opperated was all that could be desired for an instrument of this kind. Furcher than this, the results showed conclusively that the quantity of moisture in the steam of both engines was inappreciable, and that practically no difference could have been produced in the economy of the engines by differences in the condition of the steam.

That there may be no misapprehension upon the matter, I submit herewith the full records of the instrument taken on the test of the compound locomotive May 3, 1890, and those taken on the standard engine May 9, 1890. I also give a sketch showing the location and arrangement of the calorimeter as applied to the engine in service (in this case the compound engine).

Before presenting and discussing the records of these tests it might be well to give a brief description of the calorimeter, this being the first application which has been made of the instrument to locomotive use. In the form in which it was employed on the locomotive tests, the main features of the instrument are shown in the following cut. The principal parts of the apparatus consist of the two chambers *A* and *B*, which are made of ordinary steam pipe, separated by a plate *C*, which contains an orifice $\frac{3}{64}$ of an inch in diameter. The upper chamber is connected to the pipe which brings the steam to be tested, and the lower chamber is open to the atmosphere. Each chamber is provided with an oil cup containing a high grade thermometer for showing the

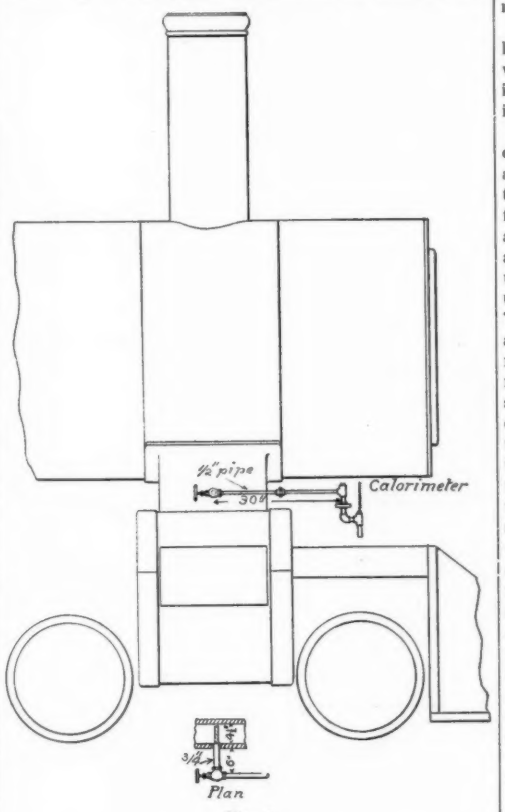


Fig. 1.

temperature of the steam at the two points. The upper chamber contains steam of nearly the full boiler pressure, whereas the lower chamber contains steam which has been wire-drawn down

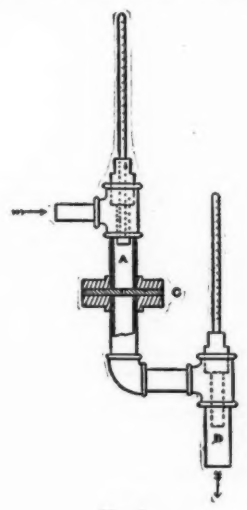


Fig. 2.

to practically atmospheric pressure. When the instrument is in use there is a continuous current of steam through the orifice, and this blows out through the open end of the lower chamber into the atmosphere. When steam is brought to the instrument in a dry condition, the effect of the wire-drawing action through the orifice is to cause the issuing steam at the lower pressure to be superheated. The normal temperature of this issuing steam (or that corresponding to the low pressure of discharge) is about 215 degrees. If the steam supplied to the instrument has a pressure of 80 lbs., it will be superheated in the chamber *B*, at the lower pressure, to a temperature of about 275 degrees. If, however, the steam is wet, the moisture which it contains will absorb some of the superheat and cause the steam to issue at a lower temperature. If the steam contains one per cent. of moisture, it has been found by experiment that the temperature of the issuing steam will be about 19 degrees lower than if the steam were dry. If the supply of steam contains two per cent. of moisture, the temperature of the issuing steam will be lower to the extent of about 38 degrees. That is to say, with one per cent. of moisture, and the normal indication of 275 degrees, the actual temperature of the issuing steam would be about 256 degrees, while with two per cent. of moisture the actual indication would be about 237 degrees. Three per cent. of moisture would carry the indication of the thermometer down to about 218 degrees, or to very near the point of saturation. It will be seen from these statements that a comparatively small amount of moisture in the steam produces an exceedingly marked effect upon the indications of the thermometer in the lower chamber. A variation of 19 degrees, or that corresponding to one per cent. of moisture, is such a wide range on the scale of the thermometer that there is no difficulty in measuring the percentage of moisture which is present to a small fraction.

In the form in which the instrument was used on the locomotive tests the thermometer in the upper chamber was dispensed with, the readings of the pressure gauge in the steam pipe passage answering the purpose which is ordinarily filled by the thermometer.

The readings of the instrument are affected to some extent by radiation from the exterior of the calorimeter, and that from the outside of the pipe which conducts the steam to it. The radiation of heat is overcome, so far as possible, by thoroughly covering the whole apparatus and the connecting pipe with hair felting. So far as it is not overcome, it has the same kind of influence upon the thermometer in the lower chamber that moisture in the steam has, viz.: to lower the temperature. The effect of this, however, is a constant one, and it is allowed for, in the practical use of the instrument, by referring the indications to what is called a "normal reading," obtained when the boiler supplying it with steam is doing little, if any, work, and no steam is being drawn off from the supply pipe excepting that used by the calorimeter. Under these conditions it is presumed that steam which enters the supply pipe of the instrument is in a practically dry state. The indication of the thermometer in the lower chamber under these circumstances is taken as a normal, to which to refer the indications on the main test when the boiler is doing its ordinary work. On the locomotive tests the normal reading was obtained when the engine was at a standstill, the brakes set and steam of the full boiler pressure admitted to the cylinders for a sufficient length of time to heat the instrument to its normal degree. On this test the pressure in the steam pipe passage was 117 lbs., and the indication of the lower thermometer was 269 degrees. This reading was taken only on the compound engine.

The following tables give the readings of the calorimeter for the two tests of May 3 and 9, 1890:

COMPOUND LOCOMOTIVE, TEST OF MAY 3, 1890.

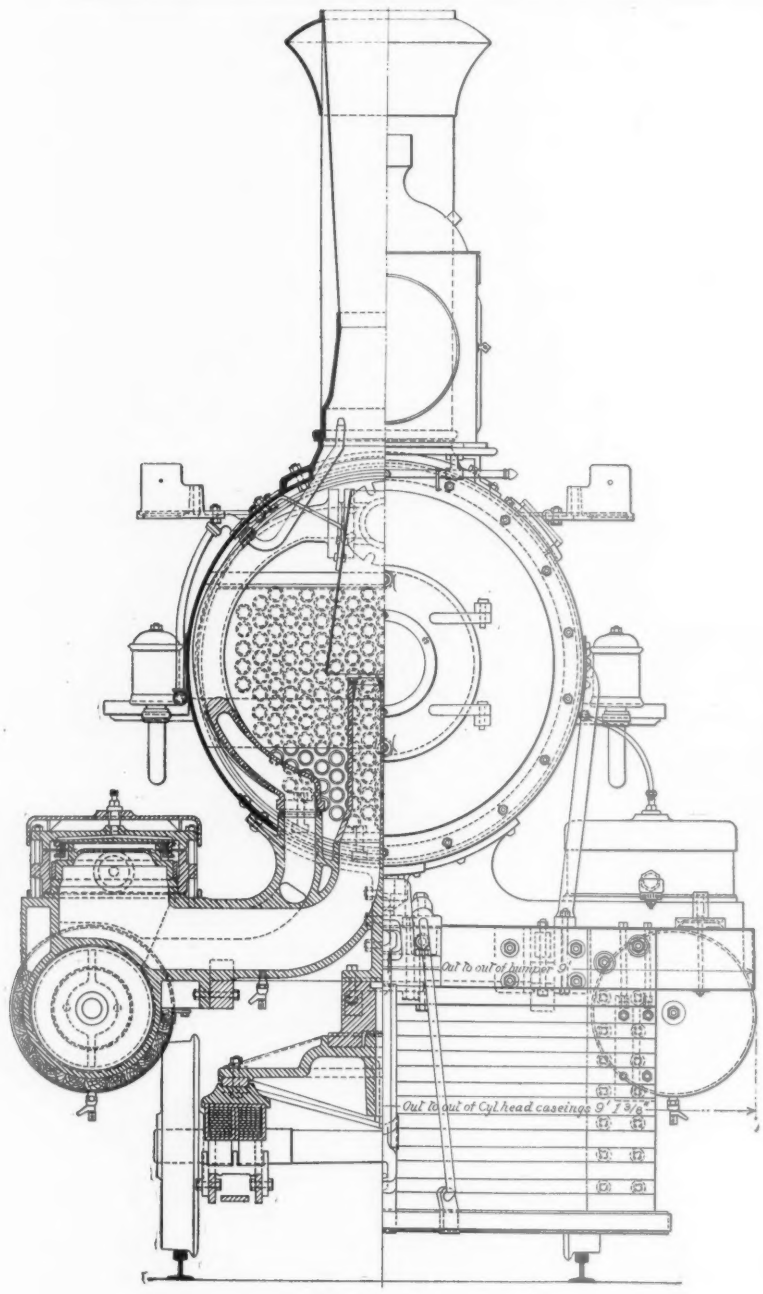
Time.	Pressure in steam pipe passage.	Temperature by calorimeter thermometer.	Time.	Pressure in steam pipe passage.	Temperature by calorimeter thermometer.
8:21	150*	248*	4:29	146	268
25	149	265	32	148	270
27	152	271	34	150	272
28	128	274	37	146	275
32	133*	257*	40	142	279
34	142	269	44	138	278
36	143	274	46	135	278
38	148	274	49	130	277
42	148	278	56	133*	230*
44	134	270	58	145*	262*
50	137*	251*	5:04	125*	238*
54	154*	260*	27	156*	242*
56	152	274	29	147*	265*
59	150	278	31	145	272
9:00	125	281	34	148	278
03	120	280	36	148	279
09	148*	267*	46	142	278
13	125	278	48	146	276
17	145	271	51	145	277
19	144	278	54	139	279
22	138	279	57	145	277
26	152	280	6:00	140	277
29	140	279	07	150*	264*
37	147*	240*	10	144	274
40	147	267	12	142	278
44	147	274	15	144	279
46	140	279	18	143	279
50	138	279	20	147	279
53	145	277	22	139	279
56	143	280	25	135	279
10:03	140	279	...	130	277
06	140	277	33	139	273
09	131	278	35	149	274
12½	108	275	38	150	275
29	138*	245*	40	137	279
33	152*	248*	45	144*	257*
36	147	270	49	143*	262*
39	145	277	51	147	272
4:22	100*	265*	57	137	244*
24	148*	240*	59	142	274
27	142*	260*			
Average, exclusive of those marked thus*.....				141.6	275.9

STANDARD ENGINE, TEST OF MAY 9, 1890.

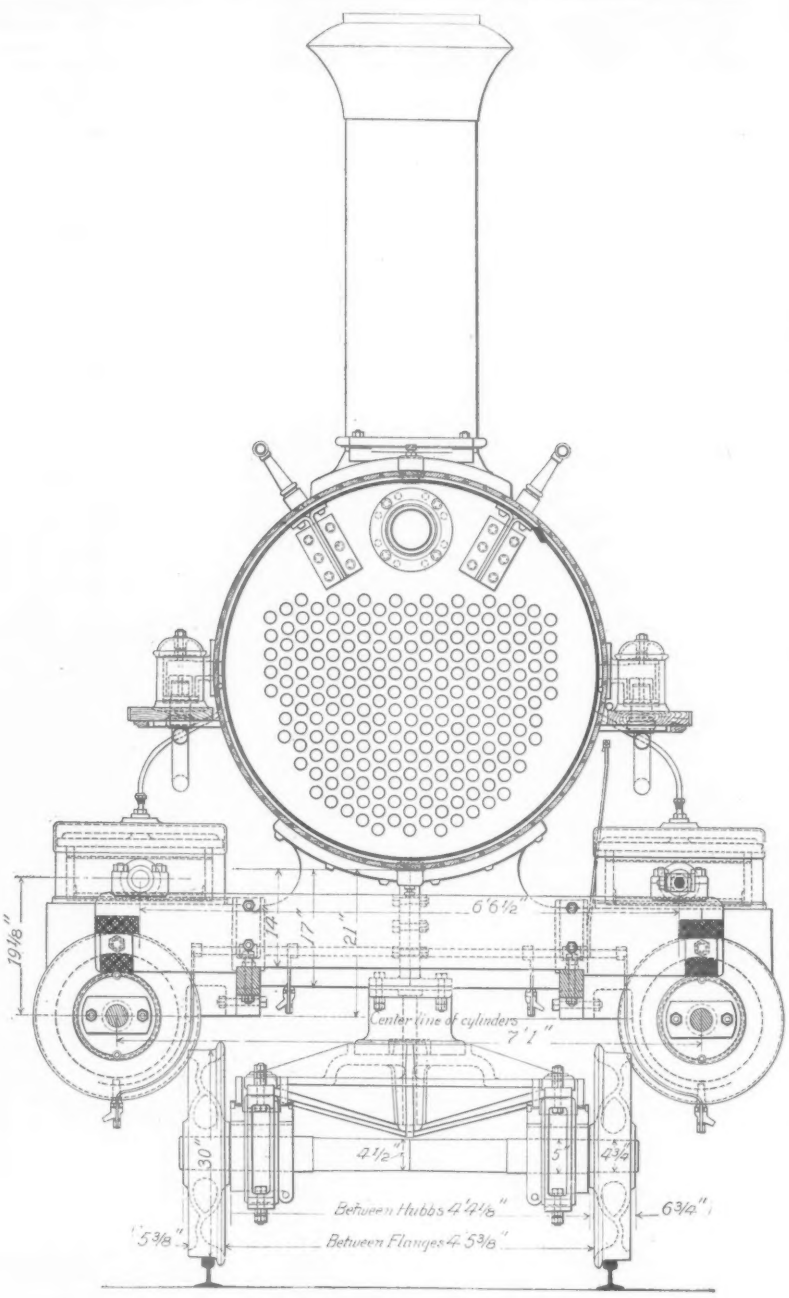
Time.	Pressure in steam pipe passage.	Temperature by calorimeter thermometer.	Time.	Pressure in steam pipe passage.	Temperature by calorimeter thermometer.
8:20	128*	230*	9:43½	128	230
23	120*	240*	45	100	235
25	120	245	47½	90	260
27½	123	248	50	....	228
33	105*	230*	52½	137*	253*
36	112	250	55	133	265
37½	122	257	58	118	267
40	124	260	10:00	120	263
42½	128	265	02½	132	256
45	125	270	05	131	260
50½	117*	235*	07½	125	265
53	116	258	10	105	265
55	128	255	30	120	250
58	125	260	35	119	255
9:00	128	258	37	132	256
02½	.....	260	40	130	265
05½	130	273	43	113*	240*
10	127	273	47½	128	268
12½	120	270	50	128	262
16	121*	258*	53½	113	265
18	128	264	55	112	267
20	128	265	57½	122	263
22½	125	267	11:00	113	265
25	125	268	02½	107	264
27½	70	273	05	98	262
36	125*	235*	07½	110	260
38	105*	250*	09½	110	258
40½	117	253			
Average, exclusive of those marked thus*.....				119.6	261.4

*Just before the readings marked with an asterisk were taken the steam had for a time been shut off from the instrument by the closing of the throttle.

The average indication of the calorimeter on the test of the compound engine was 275.9 degrees, the average pressure being 141.6 lbs. Using the normal reading



Front Elevation.



Section showing Front Guide Yoke.

TEN-WHEEL EXPRESS LOCOMOTIVE—WABASH RAILROAD.

obtained at 117 lbs. and making allowance for the difference in the pressure, the normal corresponding to the average readings on the test is assumed to be 280 degrees. The average of the test was 4.1 degrees below this normal quantity, and this degree of cooling represents the average effect of the moisture which was present in the steam. Expressed in percentage, using the proper coefficient for the observed pressure, the quantity of moisture works out $\frac{4.1}{30}$ = two-tenths of one per cent.

The average indication of the calorimeter thermometer, on the test of the standard engine, was 261.4 degrees, the average pressure being 119.6 lbs. Using the same normal reading for a pressure of 117 lbs., which was obtained on the compound engine, viz., 269 degrees, and allowing for the difference of pressure and the difference in the length of the supply pipe (which in the case of the standard engine was 6 in. longer), it is assumed that the normal to which to refer the indications on this test was 268 degrees. The average amount of cooling was therefore 6.6 degrees below the normal, and this represents $\frac{6.6}{30}$, or 0.33 of one per cent. of moisture.

Looking over the various readings of the calorimeter, it is to be noted that in the compound engine the highest reading taken at any one time was 281 degrees, and the lowest, exclusive of those marked with an asterisk (which were taken after the steam had for a time been shut off and the instrument had become cooled), was 265 degrees. If this reading also be excluded, having been taken soon after the steam was first put on, the lowest indication is 267 degrees. The range between the highest and lowest may fairly be taken, therefore, at 281 — 267 = 14 degrees. Without taking into account the effect of the fluctuations in the pressure, which were frequent and of considerable extent, the variations in the amount of moisture from time to time were confined to a difference in the cooling action amounting to 14 degrees—that is, $\frac{14}{30}$ = 0.7 of one per cent. of moisture.

Looking over the readings in the case of the standard engine, it is seen that the highest indication of the thermometer was 273 degrees, while the lowest, exclusive of those marked with an asterisk, was 243 degrees. If this last be excluded on account of its having been taken soon after the instrument was first started, the lowest indication was 248 degrees. The range here between the highest and lowest readings of the test is 273 — 248 = 25 degrees. These readings, like those given for the compound engine, are varied to some extent by changes of the pressure, which in this case were even more marked than in the other. Taking no account, however, of this effect, the extreme variation of moisture in the test of the Standard engine amounts to $\frac{25}{30} = 1\frac{1}{4}$ per cent.

These figures show conclusively that the steam produced by the two engines was in a practically dry state, and this is true not only for the average, extending over a period of several hours' service, but also for the steam which passed into the cylinders at any one time in the progress of the trip. In the writer's experience with the use of this calorimeter he has found that whenever steam was tested which goes by the commercial name of "wet steam," the indication of the calorimeter thermometer was at the saturation point, viz., 215 degrees, and, furthermore, drops of water could be seen dripping from the open vent pipe of the lower chamber. If, on the locomotives, there had been any tendency, either regularly or periodically, to wet steam, some of the moisture would have found its way into the calorimeter, and lowered the indications of the thermometer to the saturation point. It is seen from the records here given that nothing of this kind occurred, and it may be added that there was no indication at any time of water dripping from the escape pipe.

The instrument used on these tests was that part of the complete calorimeter which is called the "heat gauge," this being sufficient in cases like the ones under consideration, where the steam contains but a small amount of moisture. Where steam is wet and beyond the range of the heat gauge, the complete instrument is brought into use, which embraces the heat gauge and in addition a "drip box," which is interposed between it and the supply of steam. A full description of the complete apparatus, and examples of the work which has been done with it on stationary boilers, is given in a paper on "A Universal Steam Calorimeter," read before the Cincinnati Meeting of the American Society of Mechanical Engineers, in May, 1890.

Boston, Oct. 2, 1890.

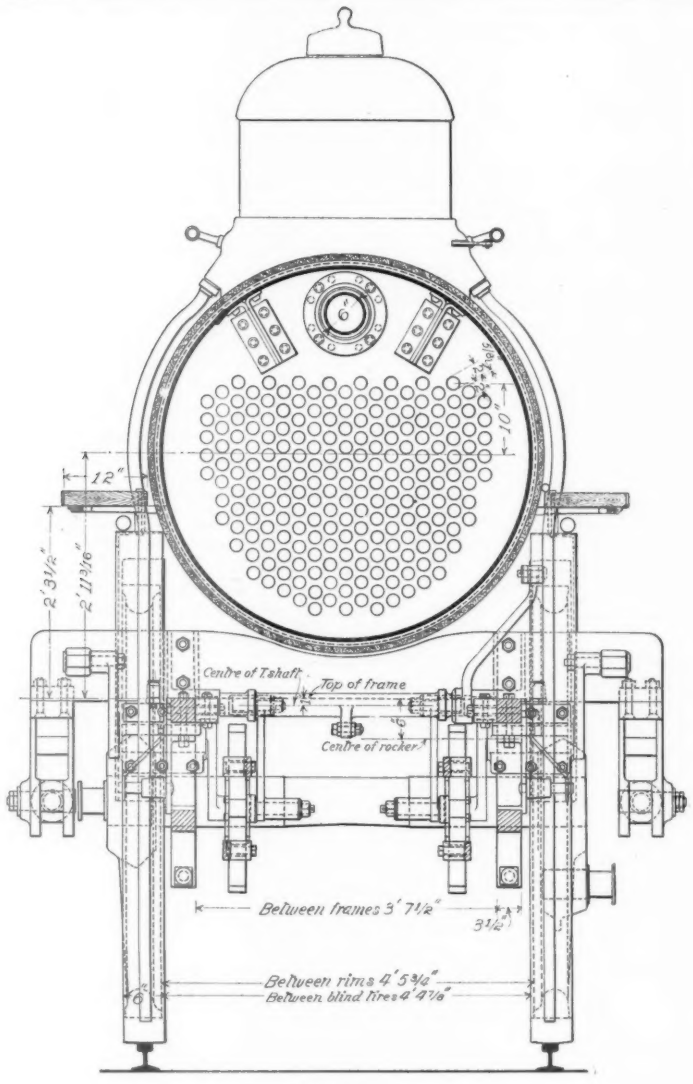
Wabash Ten-Wheel Express Locomotive.

[WITH AN INSET.]

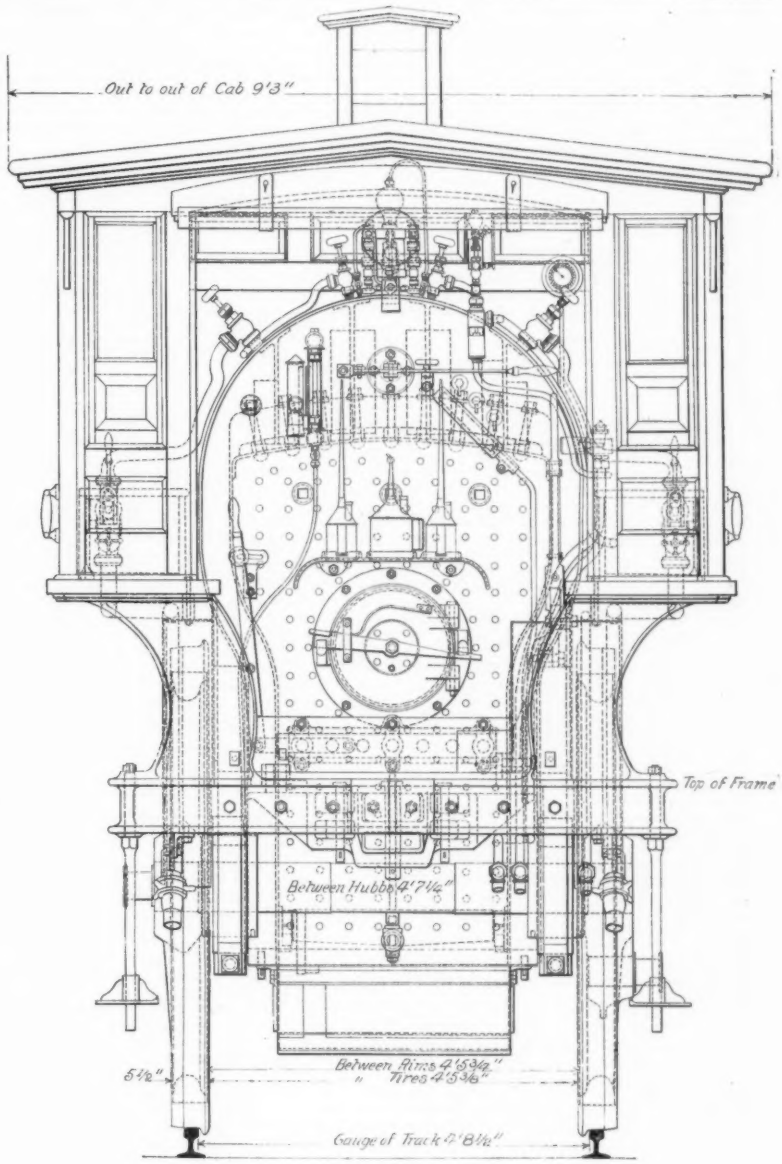
We show herewith the design of the ten-wheel express locomotives which are running on the Wabash road. They were designed and constructed by Mr. J. B. Barnes, Superintendent of Motive Power, for heavy service in hauling fast passenger trains. The locomotives were built at the Springfield shops of the Wabash road. The Wabash standard firebrick arch with circulating tubes is used on these locomotives, but the new feed water heater has not yet been applied.

Several peculiarities of construction are noticeable, probably the most striking being in the cross-head guides. The total length of the cross head is greater than usual, and the guides are attached to the cylinder heads and frames in a peculiar manner. They are extended back of the front driving wheel, and are there attached to the frame by a guide yoke 1¾ in. thick, having a foot thereon to which the guides are bolted. This yoke is attached to the frame by a large cast-iron knee, shown in the section and side elevation. At the front end there is a similar guide yoke without a knee, to which the guides are attached by means of a block. On the top of this yoke is a bearing for the valve rod, which has a hinge connection, and also a key joint. The construction of the valve rod seems a little complicated for the requirements of the case. It will be noticed that the guides are not in any way attached to the cylinders, but are supported and kept in alignment wholly by the frame.

The smoke-box arrangement is one devised by Mr. J. B. Barnes for the Wabash engines. It has some fea-

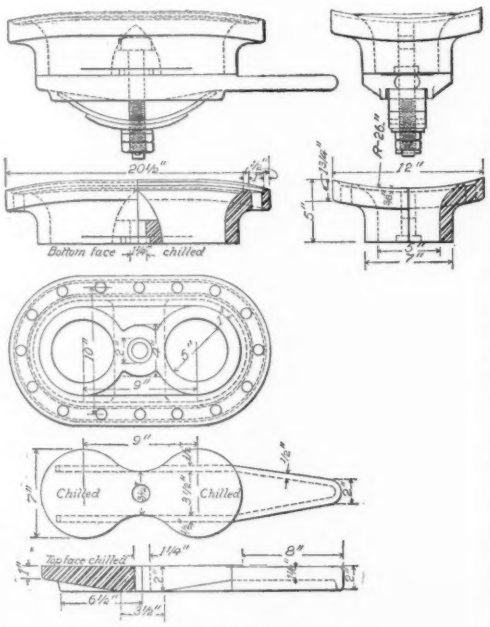


Mid-Section.



Back End Elevation.

TEN-WHEEL EXPRESS LOCOMOTIVE—WABASH RAILROAD.



Details of Cinder Valve.

tures which are novel. It is shown clearly on the sections, and requires no further description, except possibly to call attention to the location of the blower pipe, which ent rs the smoke box from the side near the top. The cinder valve under the smoke box is of peculiar design, which has been very successful on the Wabash road. It is here given in detail, and consists of a cover with a chilled face held on to the face of the valve seat by a plate spring, and rotated by means of a handle which projects toward the front of the engine when the valve is closed. It is a simple device and one which may be easily kept tight, and is not liable to stick or become inoperative. Openings for air at the back of the fire box are controlled by a lever on the fireman's side, as shown on the end elevation.

The engine truck has double springs, two on each side. Babbitt, in the form of disks, ¾ of an inch in diameter and ⅜ of an inch thick, is used in the bearings, such as the cross-head blocks, rod and driving brasses and eccentric straps. The counterbalancing has been carefully considered in these engines, and it is reported that they run with a great steadiness at high speed, both on curves and tangents.

It is unnecessary to describe the details further, as the excellent drawings show the construction clearly.

The principal dimensions and particulars are as follows:

Weight on drivers in working order	80,000 lbs.
" " truck " " "	21,000 lbs.
Total weight " " "	101,000 lbs.
Weight of tender " " "	70,000 lbs.
Cylinders, diameter and stroke	18 in. × 24 in.
Steam ports	15 in. × 1¼ in.
Exhaust port	16 in. × 3 in.
Balanced valves of Wabash pattern—	
Travel of valve	5½ in.
Outside lap	⅞ in.
Inside "	1-64 in.
Boiler, with 8-in. wagon top—	
Diameter outside smallest ring	54⅝ in.
Thickness of steel plates 7-16 in., except throat	½ in.
Fire box, inside length	71¼ in.
" " width	33⅜ in.
" " depth at centre	75¼ in.
207 flues 2 in. diameter	14 ft. 3 7-16 in. over all.
Heating surface of fire box	127 sq. ft.
Heating surface of tubes—outside	1,510 ft.
" " total	1,637 ft.
Area of grate	16.5 ft.
Working steam pressure	170 lbs.
Smoke stack, Wabash pattern—	
" " height above saddle joint	5 ft. 2¼ in.
" " " top of rail	14 ft. 10½ in.
" " inside diameter at base	17½ in.
" " " " " throat	13 in.
" " " " " top	18¾ in.
Exhaust nozzles—double, diameter	3⅝ in.
Top of nozzles, above centre of boiler	1½ in.
" " " netting	3 in.
Lifting pipe, at bottom, oval	16 × 2¼ in
" " top, diameter	11 in.
" " bottom, above nozzles	½ in.
" " top, below top of arch	3½ in.
" " " " throat in stack	2¼ in.
Centre of boiler, above top of rail	7 ft. 3-16 in.
Dry pipe, inside diameter	5½ in.
Piston rods, diameter	3 in.
Cross heads, Laird pattern, length	24 in.
" blocks of brass.	
" guides of steel.	
Radius of links	4 ft. 1 in.
Length between centres of main rod	8 ft. 8 in.
Diameter of driving wheel centres	5 ft. 2 in.
" " truck wheels, cast iron	2 ft. 6 in.
Thickness of tires	3½ in.
Wheel base, driving	15 ft. 10 in.
" " rigid	8 ft. 6 in.
" " truck	5 ft. 9 in.
" " total of engine	25 ft. 10½ in.
" " total of engine tender	47 ft. 11⅝ in.
Driver brake, American pattern, with Ross-Meehan shoes.	
Capacity of tender, water	3,300 gallons.
" " " coal	6 tons
Tank 18 ft. long × 50 in. in height.	
Tender, wheel base	15 ft.
" between centre of trucks	10 ft.

Steel-Tired Wheels and the Ross-Meehan Shoe—New England Railroad Club.

At the meeting of Oct. 9, 1890, President Richards occupied the chair, and announced as the subject for discussion at the next monthly meeting, "The Economy and Safety of Swing-Motion Trucks as Compared with Rigid Trucks," and the subject for the present occasion, "Steel-Tired Wheels—Method of Equalizing their Wear, and Machinery for Turning them Off," to be opened by Mr. J. N. Lauder, of the Old Colony road.

Mr. LAUDER: I approach this subject with a good deal of diffidence, because of its magnitude. Either one of the branches of the subject would be sufficient to occupy the evening. . . . In the matter of driving wheels it is not perhaps necessary to say anything, since it has become the universal practice in this country to use steel tires on driving-wheel centres. The time was when driving-wheel tires were used made largely of chilled cast iron, but the steel tires have driven them entirely out of use.

As regards engine-truck wheels, tender and car wheels, the practice of using steel tires has not become universal, and probably never will in this country, on account of the additional cost of running steel-tired wheels over the cost of running chilled cast-iron wheels. I think there is no question that it costs more per mile to run the former in any kind of service than the latter, with the possible exception of some very long through runs, such as are made by the Pullman and Wagner cars, running between points east and west, as between Chicago and the Pacific coast. In that case I think the cost per mile would figure as low with steel-tired wheels as with chilled iron wheels, because the wheels are worn out so much more rapidly than those in use on local trains that the item of interest on the money invested does not count to that extent. But for all ordinary purposes the chilled wheel undoubtedly is very much cheaper to run than any steel-tired wheel that has yet been made.

The reason that steel-tired wheels are coming more largely into use, notwithstanding they cost so much to run and maintain, is because it is generally supposed there is more safety in their use. The question, however, of the comparative safety of the two wheels is still an open one to my mind. When we consider how many hundreds of thousands, perhaps millions, of chilled wheels are run at the present time all over the United States, we find that the percentage of breakages is so small as to be hardly worth considering; but once in a while a chilled wheel breaks. Now, if a train is ditched or derailed, especially a passenger train, on account of a chilled wheel breaking, the railroad is put in a very bad position before the public, before the Commissioners, if the state has them, and before the courts;

while on the other hand, allowing that the steel-tired wheel is no safer than the chilled wheel, if the train is derailed by a broken steel-tired wheel, the road stands much better before the public, the Commissioners and the courts than if they had used the cheaper wheel, because it can truthfully say it has used the best known wheel without regard to price. That is the reason that most of our roads, especially here in the East, where our laws are very rigid, are equipping their passenger rolling stock with steel-tired wheels. There is this to be said in favor of that wheel, as regards safety, that in the manipulation of the tire in the process of manufacture any mechanical defects in it can very easily be detected, and the tire rejected, which is not the case in the making of cast wheels.

Solid steel wheels are being made in different parts of the country. My chief objection to that kind of wheel, allowing that we get the mileage out of it that we do out of other wheels, is that it is almost impossible to detect defects that may exist in the structure of the wheel during manufacture, much more difficult than in the making of cast-iron wheels, and until the makers can overcome this difficulty they will have up-hill work in introducing their wheels. We all know the importance of having every wheel absolutely sound.

In regard to the maintenance of the steel-tired wheel, I consider this branch of the subject as the most important, because when such wheels get sharp flanges, and have to be removed and turned, that is an expensive job. Any means that can be devised to prolong the time between turnings, and at the same time keep the tire in reasonably good condition for service, is a step in the right direction. I regret on one account that our friend Mr. Snow, of the Ramapo Works, is present, because I have got to say, in justice to him and to ourselves, some rather complimentary things in reference to one of his productions that we use. I allude to the so-called Ross shoe. We have used this shoe for several years on our road, and we have come to the point where I am quite enthusiastic over its performance. The shoes furnished by Mr. Snow some years ago had a very detrimental effect upon the face of the tire. I had some tires badly cut by the so-called Ross-Meehan shoe, which is a shoe with steel slugs in the face of it. The object was to keep the tire worn down on the outer part of the tread, and on the flange as fast as the rail wears the tread. But my observation is that the Ross-Meehan shoe, especially in suburban service, where there is much braking, wears the tread of the wheel faster than the rail wears it, making the tire imperfect in a short time, and to some degree dangerous. To obviate that difficulty we have used the shoe without the slugs, what is called the Ross shoe, made of a good quality of cast iron. That shoe, in all local service where the brakes are applied quite often, seems to just about keep the wear of the tire uniform over its whole face. I have recently removed the tires of 42-in. wheels that have made 144,000 miles between the first and second turning; up to the first turning they had made 44,000. This was perhaps not all due to the Ross shoe, but largely due to it. . . . The Ross shoe is the only device I know of that will prolong the life of the tire and give it qualities that will keep it in use much longer between turnings.

This form of shoe has another quality that I am at a loss to account for, and that is, it seems to keep the flanges from getting sharp. This may, perhaps, be explained in part by the fact that the ordinary plain shoe might be hung in such a way as to have a tendency to sharpen the flange, while the Ross shoe is held in position by locking over the flange, so it will not have that effect.

Now, in relation to the third branch of the subject, machines for turning off the wheels, trueing up the tires when they become worn out of shape, we are familiar with the four or five different designs in use of car-wheel turning lathes. They are all based, I think, practically, on one principle; I think they are all patterned from the original lathe that Mr. Washburn designed at Holliston, and have the same underlying elements that that machine had. . . . We have heard some pretty wild statements as to the capacity of different lathes. I have heard it insisted upon that in 10 hours' time six pairs of wheels could be turned; that the average was four pairs per day. I cannot get any such service out of my machines; I have three of different manufacture, and I think they do well if they turn two pairs of 42 in. wheels in a day. I know that under some circumstances more rapid work can be done; for instance, on tires not badly worn, that simply want trueing, or that may be of very soft iron; but taking the tires as they ordinarily are, worn badly, in all sorts of shapes, with hard spots in them, I don't think it possible to turn more than two pairs of 42-in. wheels per day and follow it.

Mr. MARDEN: We have been using steel-tired wheels to a certain extent since I have been with the Fitchburg road, which I went into in 1881, and we are now equipping the balance of our passenger cars with those wheels. There were a few pairs under passenger cars before I went there. Of all the wheels put under since 1881, I think we have removed but one pair for being worn out, and that pair made 399,000 miles, if I remember rightly. We made a comparison between certain chilled wheels and steel-tired wheels, and took the average, to satisfy ourselves as to the cost of running each kind, and if I remember correctly the balance was very slightly in favor of the steel-tired wheel; they were very nearly equal. But there is another thing in favor of the steel-tired wheel which we consider worth considerable money to us, and that is that the cars can run a longer time between the times of turning the tires than cars with chilled wheels; cars with chilled wheels are constantly in the shop. Slid wheels have run from none out to 80 per cent. out four or five years ago; I think during the last two years they have run only 25 per cent. out.

There are several reasons for sharp flanges, and we make it a practice, when a pair of wheels commence to sharp-flange, or if the sharp-flanging commences on one side and not on the other, to turn that pair of wheels round and try them the other way; and we are very careful in mating up our wheels. The tires we are using are principally of American make. As to the matter of keeping the tires in shape between turnings, the only remedy we have is in watching the wheels closely, and in turning up wheels as soon as they show any degree of sharp-flange. I believe I get a larger mileage by turning off wheels every 50,000 miles, if they commence to sharp-flange, than by letting them run as long as they will run safely. We have one of the Miles lathes, and that was guaranteed to turn off a minimum of four pairs of wheels per day; and when we first had it in we had Mr. Miles there quite a number of times to try to make that lathe do that amount of work. We have once in one day turned off six pairs of Pullman 42-inch wheels; but, taking the different kinds of wheels, I don't think we average more than two and a half pairs of wheels per day.

We should not be equipping the remainder of our passenger cars with steel-tired wheels unless we believed it was more economical and more safe. A steel-tired wheel, if it has a tendency to give out, will give considerable warning, while a chilled wheel will burst up at once. A chilled wheel, especially on heavy grades, has a tendency to become pretty thoroughly heated and to crack. I never knew of but one pair of steel-tired wheels slid flat.

Mr. SNOW, of the Ramapo works, was called upon, and read the following paper: The method of equalizing the wear of steel-tired wheels is a subject of much more interest than the casual observer would at first suppose. It is a subject which deeply interests the engineer and road master, as well as the mechanical department of all railroads. There is nothing so injurious to the track, frogs and switches as a badly torn tire; many a rail, frog and switch has been broken or spoiled by a tire worn to a *double flange*. It is also presumable that many pins and connecting rods have been broken from the sudden jar of the mounting of the frog or switch by the raised part of the tire not worn by the stock rail.

To avoid these difficulties, the remedy has been to jack up the engine or car, take out the badly worn tires, turn them up and return them to the car or engine, all of which takes time and costs money, and the engine is out of service while this is being done. These are simple facts known to all present. The remedy of putting the tire in the lathe is good and efficient. But is it always done when it should be? Every railroad man present will say no, because, first, we are short of motive power and cannot spare the engine; again, the big lathe is full of work and we cannot spare it to turn the tires; again, the engineer or inspector neglects to report the same to his superior officer, and so the tires are allowed to go on hammering and pounding the rails and switches, and have caused more expense than the cost of a new set of wheels and tires complete.

For equalizing the wear of these tires and keeping them in good condition, thereby saving the expense and trouble of putting them through the shop, and without losing the service of the engine, we know of nothing better than a brake-shoe so devised that the same shall wear that part of the tread and flange of the tire not worn by the rail. A shoe of this description will not touch the tire at the line of rail wear, and when made of such suitable material as will keep the flange and tread in its original shape is an important factor in connection with the subject under consideration. Such a shoe was invented in 1886 by George B. Ross, Master Mechanic of the New York, Lake Erie & Western Railroad, and it is now in use by a very large number of railroads in all parts of the United States, and is giving excellent results. This form of shoe can be made from any metal which is most suitable to produce the results desired.

For a locomotive tire the best results so far obtained have been by the use of steel pieces inserted in the flange and outside of the tread, and by the use of solid steel for the whole shoe. The former device is known as the Ross-Meehan.

For car and engine tender wheels the steel pieces are objectionable, as in some cases they wear the tires faster than the rail. This difficulty has been overcome by making the shoes plain, leaving out the steel pieces, and using a special mixture of metal made from charcoal iron, manganese and aluminum. With this mixture the tire is kept in good condition with the line of rail wear.

An attempt was made some years ago by the Great Eastern of England to use a shoe something like in appearance to the Ross shoe, but it was made to brake only on a part of the flange and on the outside of the tread. This shoe wore into the flange and destroyed the contour of the tire, and after a time the shoe was abandoned. The same device was tried by Mr. Ross with similar results. He, however, continued his experiments, and to him we owe our gratitude for producing the form of shoe which is giving such satisfactory results.

There may be other methods of equalizing the wear of tires, but this appears to be the most practical and simple, and it commends itself to the favorable consideration of all railway officers.

Mr. ADAMS: Can you give the reason why the locomotive driving wheels are not as much affected by the shoe as car wheels, both having the same kind of steel tire?

Mr. SNOW: It is owing principally to the fact that the locomotive driving wheel does not get the same braking that the car wheel does.

Mr. LAUDER: I am glad Mr. Adams mentioned that matter, because it is true that the Ross-Meehan shoe does cut and wear tender and car wheels faster than the line or rail wear takes place, while I have never seen a driving wheel cut or even marked by the Ross-Meehan shoe, even though they have the same brakage as the car wheels do. The difference may be caused by the difference in the diameter of the wheels. We use the Ross-Meehan exclusively on driving wheels and a plain shoe—the same that Mr. Snow has described—on car wheels. The Ross-Meehan shoe has given unfavorable results on car wheels of 38 to 42 in. diameter, cutting grooves into the tire. The Brunswick tire, though soft, has given good wearing results.

Mr. ADAMS: We almost ruined a number of pairs of wheels by using the Congdon shoe, which has the elements of the Ross-Meehan shoe, not the shape. I agree fully with Mr. Lauder and Mr. Snow as to the practicability of a good cast-iron shoe made of good metal, after the Ross plan, for steel-tired wheels, and I think wheels will need turning much less often than if a plain shoe were used.

With regard to the wearing of steel tires, we have had a great deal of experience with them; we have run steel-tired wheels under our passenger cars for 20 years and they have been entirely equipped with them for at least a dozen years. Our experience demonstrates that steel wheels are more economical on long runs than others. I agree with Mr. Lauder that a wheel has got to make a certain amount of mileage to be profitable. A steel wheel that will make 200 miles a day is cheaper to run than a cast-iron wheel, and a good deal safer. A great majority of the roads are dropping into their use; all that can afford it are trying them.

As to the economy of service, I think a great deal depends upon the attention paid to the wheels and their removal at the proper time. . . . If the side bearings are not adjusted properly the flange wears off the wheel. If the truck is suitably constructed and the car bears on the centre, the flange will not wear so badly. The wheels vary somewhat in the amount of carbon used, and some will be harder than others; and as soon as this is discovered they should be changed and properly mated. There are not as many steel wheels spoiled by sliding as cast-iron wheels. I cannot explain that, but it evidently is so. Naturally we would say that a chilled piece of iron is harder than a piece of steel that you can turn in a lathe, but it will flat quicker than steel, and I would like to know why it is so.

We have two or three kinds of lathes, but not any that will turn more than two and a half pairs of wheels a day on the average, but, of course, it makes a difference as to what kind of a wheel you are turning. I have seen a pair of wheels that it took 20 hours to turn, and there are others of which you can turn five pairs a day. I have noticed that some of the harder wheels do not make as much mileage as some others that are a good deal softer. We would suppose that the harder the tire the longer the wheel would run, but that does not seem to be the fact in our experience. [Mr. Adams explains that he does not mean to say that a soft tire will wear longer than a hard one, other things being equal; but that a tire very hard and brittle will disintegrate faster than a softer and more tenacious tire.]

Mr. MARDEN: We have found in our experiments with the Ross-Meehan shoe that there is less wear and cutting upon wheels of larger diameter than upon those of small diameter. I think to make a success of the Ross-Meehan shoe for passenger service—and perhaps it would be better for the Ross shoe also—it ought to be hung on a pivot, so that the brake should have a lateral motion, and adapt itself to curves, so that it can be brought square up against the wheel and not cut either way on the flange of the wheel.

Mr. SNOW: Such a device was put into use in Chicago two years ago, and has given excellent results.

Mr. CLARK: Do you believe the Ross shoe cuts more on small wheels than large ones?

Mr. MARDEN: From my observation I find it so.

Mr. CLARK: Don't you think it is due to the friction and velocity, the greater heating tendency, the burning of the two metals together?

Mr. MARDEN: I don't think so much is due to that. I think there is something in favor of the locomotive tire in the fact that it does not have the brakes applied so much as on passenger cars.

Mr. CLARK: I represent the Niles Tool Works of Ohio. I have taken an interest in the turning of steel-tired wheels, and built a good many machines that are working in various parts of the country. We have a great variety of reports in regard to the capacity of the lathe for turning out work, one man saying it will do three times as much as another man. I think the lowest average that has been spoken of is two and a half to three pairs of wheels in 10 hours. The lathes are used by the Pullman Co. almost exclusively, and they turn out two and a half to three pairs a day. There is a variation with wheels on different divisions of the same road, from the fact that the grades are heavier and the brakes more used in some places than in others. We have letters saying that six pairs can be turned in 10 hours, and in those cases we have found the tires were very soft or the wheels were put into the lathe very often; that is, before they became much worn.

Mr. SNOW: Is there anything known about the Miltimore machine?

THE PRESIDENT: I did my best to have a representative of the Miltimore machine here, but failed. That machine lies dormant at present, on account of legal and financial difficulties. The idea is this: Take a circular plate of ordinary iron, without teeth, and run it at high speed, and it will cut off any metal that can be brought to it. There seems to be little difference between cutting a piece of wrought iron and a file, which, you know, is one of the hardest of things. The same principle is applied in the cutting of I-beams, which have been cut in that way for several years. Miltimore's invention was in adapting the machine to the cutting of wheels. The car wheel is made to revolve very slowly, say three or four times a minute, and the blank wheel of the machine, which revolves 2,000 times a minute, comes in contact with it and wipes the metal off, as it were. The difference between turning off wheels of different hardnesses is not apparent. I saw a wheel badly worn put into the grinder, and in twelve minutes the wheel was made perfect in every way. A chilled wheel is turned as rapidly as a steel wheel. If a wheel is badly worn they pass it around several times; if slightly worn one revolution completes it. It seems to me that in a good machine of that kind there would be no difficulty in turning off thirty pairs of wheels per day. [This machine was illustrated in the *Railroad Gazette* May 27, 1887.]

Mr. COUGHLAN: I disagree entirely with Mr. Lauder as to the economy in using chilled wheels as compared with steel-tired wheels. It has been demonstrated that there is a saving to the road with which I am connected of 25 to 30 per cent. by using steel wheels under passenger cars. I have never been able to get more than an average of 25,000 miles out of chilled wheels during the 15 years I have been upon the road. I have used six pairs of chilled iron 30-in. wheels to one turning of steel wheels on the same truck and on the same service, taking the wheels just as they came. Safety and economy are on the side of steel wheels. With regard to the Ross-Meehan shoe, I have found that it never injured the wheels until the shoe itself was partly worn through, and then the steel piece which is cast in begins to work round and get loose and the cutting commences, but not till then. That trouble became so frequent we abandoned that shoe. The Ross has given very good and satisfactory results. We are obtaining very satisfactory results from the use of a solid steel wheel; we have about 100 of them in use now. I think the reason why the chilled iron wheels suffer more by sliding than the steel wheels is that in producing extreme hardness of wheels by the chilling process the adhesion is entirely destroyed, and therefore the wheels will slide; whereas, with a medium hard, tough wheel, the adhesion is retained. The latter will also wear away gradually, while the former will crumble away rather than wear like the other.

The Wear of Driving Tires Fitted with the Ross-Meehan Shoe.

As bearing directly upon the principal subject of discussion at the last meeting of the New England Railroad Club, which is reported at much length in this issue, we are able to give the following diagrams, showing results obtained by the use of the Ross-Meehan shoe on a certain locomotive. The diagrams were taken from the tires of Old Colony engine No. 32, Class C.

This engine is used in switching passenger trains, involving a constant use of the driver brake, applied to all drivers. The Ross-Meehan shoes, as well as the driver brake, have been used from the first, and the tires have never been turned. The tires went into service April, 1889, and have made a mileage of 36,540. They are of Midvale steel.

The diagrams are one-half full size and are made di-

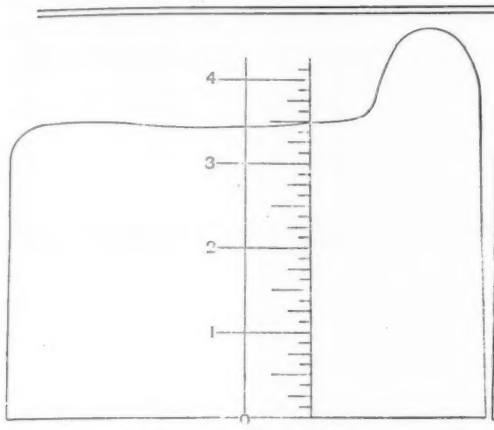


Fig. 1—Right Front Driver.

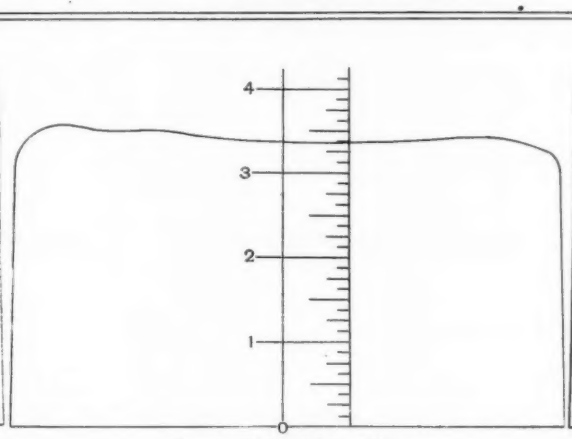


Fig. 2—Right Middle Driver.

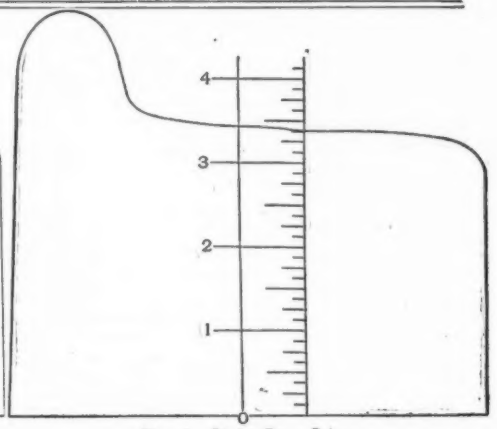


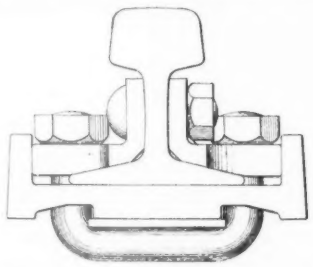
Fig. 3—Right Rear Driver.

WEAR OF DRIVING TIRES WITH ROSS-MEEHAN SHOE, AFTER 36,540 MILES.

rectly from the official tire indicator cards. The excellent condition of these tires is very well shown. We do not know their original thickness or how much metal has been lost, but the quite uniform wear is obvious from the diagrams. It will be noticed that the rear tire is more worn on the outside tread, where the rail wear seldom comes, than is either the front or the middle tire. The difference is not very great, but still it is marked. The fact that this difference of wear is occasionally seen is mentioned in the discussion before alluded to, and is ascribed to variations in the quality of the metal in the shoes. We have frequently noticed on suburban engines, where the driver brakes are often applied, that the outside of the tread is more worn by the brake shoe than is that part of the tread which takes the wear of the rail alone. Very likely the quality of the material put into the brake shoe has something to do with this. On the other hand, it is quite probable that in the case illustrated in these diagrams this peculiar wear of the tread is due to defective equalization of the driver brakes: that is, the brake is applied with greater power to the rear wheels than to either of the others. In any event, these diagrams illustrate a lesson which we have frequently drawn, viz., that the time out of shop of a locomotive may be very greatly increased by the use of the Ross-Meehan shoe on the brakes.

Clark Fisher Combination Rail Joint.

It will be remembered that the Fisher joint was one of the five recommended for trial by the Roadmasters' committee. In the illustration we show the latest modification of this joint, which consists in the use of two short angle plates held with two bolts. Otherwise the joint is the same as that with which railroad men have



long been familiar. The angle plates have been introduced partly to meet the criticism sometimes made that the Fisher joint does not preserve the alignment of the rails; they also serve to hold the rails against creeping, as will be readily seen from examination of the engravings. These angles are made of steel. The base plate is made, as heretofore, of wrought iron. Attention is called to the steel spring inserted between the clip bolts and the base plate. This spring has a capacity of 15,000 lbs. and prevents the slacking of the nuts which hold the bolt. The Fisher joint has long been standard on the Fitchburg and the Cumberland Valley, and is also standard on the Manhattan Elevated. We are informed that it will be used on the Chicago & South Side Rapid Transit, or "Alley" Railroad, building in Chicago. Those who have used it longest are its best advocates. We are told that on the Cumberland Valley the cost of maintenance of track at joints is reduced with the Fisher joint to about one-fourth of what it is with the angle splice. A few miles of new track were laid on a branch of the Grand Rapids & Indiana with the Fisher joint about four years ago. An inspection of that track made last month showed the joints to be still in admirable condition.

Railroad and Other Matters in China.

A personal letter from China informs us that an expedition was made this summer, by the way of Moukden and Kirin, from Victoria Bay to the Russian frontier at Hun Chun, on the Tumen Ho, in order to ascertain what railroads are needed in that country and may profitably be built. The members of this expedition were Mr. C. W. Kinder, the well-known Engineer and Superintendent of the China Railway Company; Mr. Alexander Coxe, C. E., of Adelaide, Australia; General Chow and Commissioner Wu Nan Ko, with 50 servants and soldiers. We understand that the report will be against building the line to Hun Chun, inasmuch as it would be captured by Russia in case of war, China being quite unable to defend it. Therefore, a road from the port of New Chwang to Kirin, some 450 miles, will be recommended. Whether or not this will be built seems to depend upon the success of the negotiations for a cheap silver loan from America. The traffic will be principally emigrants and grain. There is coal at several places on the line and timber is abundant. The country north of Kirin is rich and fertile, and for a short distance well peopled by Manchus and Chinese. Beyond that is a beautiful, hilly country, much resembling British Columbia, almost unpopulated.

The expedition returned by way of Vladivostock and Corean ports. Vladivostock is strongly fortified and full of troops. In Corea the Japanese are pushing matters energetically and rapidly opening up trade with fine steamers. Their settlements are clean and well placed, and as the Japanese have the conquering and civilizing instincts of the Anglo-Saxon race, their growing power in Corea is a matter of some anxiety to the Chinese.

Viceroy Li Hung Chang some time ago ordered a plant for iron works near Canton, and when he was moved to Hankow he ordered the plant to be sent there after him. It is said that the works will be started at once, and the Viceroy has offered to supply rails for any Chinese extensions. That he will be able to do so, however, seems still very doubtful. The ore is good but the coal supply is small.

The Railroads of Peru.

In this country the slopes of the Andes come down to the Pacific Ocean in most cases. These are cut with deep valleys, and the intervening ridges are so sharp and high that a north and south line will be so very costly that it will be financially impracticable for years to come. Most of the roads may be called local ones. They start from the coast and each one reaches back into the country without reference to any other line starting from the ocean.

In two cases only there are systems. The Central Trasandino (Oroya) road, with the Ancon branch, and later a branch to Cerro de Pasco, make up the central system. The southern system consists of the Mollendo & Arequipa road, the Arequipa & Puno road, and Juliaca & Cuzco road. The central system now operates 129.5 miles, to which the extensions now under contract and building will add about as much more. Then a line is proposed (and has been surveyed) to start from near Cerro de Pasco to go to navigable water on one of the branches of the Amazon. By this route the distance from Callao, on the Pacific Ocean, to the navigable waters of the Amazon is about 400 miles. The southern system has 407 miles in operation, and the contract has been let to extend the Juliaca & Cuzco road from Santa Rosa to Sicuani, a distance of 42 miles. This road (the J. & C.) starts from the Arequipa & Puno road at Juliaca, 29 miles before reaching Puno, and runs nearly due north from Cuzco, 210 miles distant. This is now finished and in operation to Santa Rosa, 70 miles. Much work in grading has been done on other portions of the road, and it seems probable that not many years will elapse until it is finished to Cuzco.

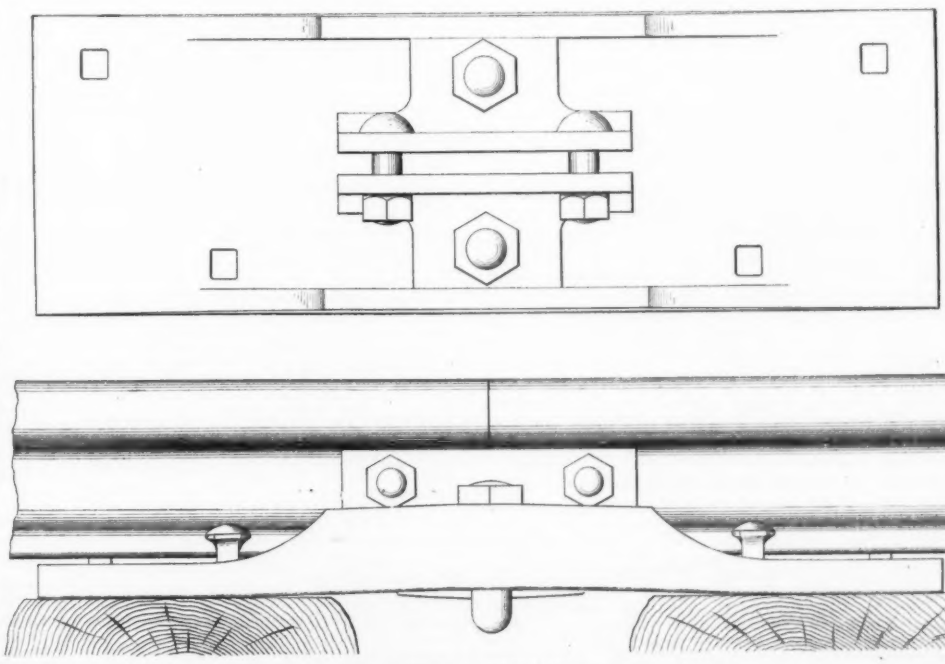
These roads, with others, were built by the Peruvian government with money obtained by the sale of bonds in England, the interest not having been paid for a number of years. The roads have recently been turned over to the bondholders in accordance with the terms of a contract with M. P. Grace & Co., which has been published during the present year.

The roads turned over to the bondholders aggregate 927 miles, now in operation. Ninety miles were destroyed during the war with Chili, and 57 miles were destroyed by the extraordinary freshets that occurred some years ago. None of the portions destroyed have been rebuilt.

There is a small, isolated road at Cerro de Pasco. It was built to carry ore from the mines to the works down the valley, and is only remarkable from the fact that all the materials for building it—bridges, rails, rolling stock and tools—were carried over the Andes by mules.

The central system will cross the continental divide through a tunnel, and at an elevation of 15,722 ft. above the sea level. The southern system has already crossed the western range at an elevation of 14,200 ft., and descended into the valley of Lake Titicaca. It is now ascending the other range and will cross into the Amazon Valley at an elevation of 14,666 ft. The lowest elevation on this road will be 10,050 ft

The Lima Railways Co., limited, consists of a line from Lima to Callao, 8.5 miles, and another from Lima to



THE CLARK FISHER COMBINATION RAIL JOINT

Made by the FISHER RAIL JOINT WORKS, *Trenton, N. J.*

Chorillos, nine miles. The first connects Lima with its port, and the second with its summer resort for sea bathing. These roads are owned by a company in England, and, with the exception of some private roads on sugar estates, are the only ones not owned by the government. M. R.

Lima, Peru, Sept. 12, 1890.

The Bonzano Tie.

This is a steel tie recently patented by Mr. M. F. Bonzano, Assistant General Superintendent, Philadelphia & Reading Railroad. The engravings show the tie in such detail that a description is hardly necessary.

Fig. 1 shows one-half of a tie in plan and elevation. Fig. 2 is a section on *A B*, fig. 1. Fig. 3 shows the tie applied to a 90-lb. rail at a joint.

It will be seen that the tie consists of a steel channel, rolled to the section shown in fig. 2. Slots are then cut at either end and in the middle part of the body of the tie, as indicated in the elevation, fig. 1, and also in fig. 2. By this means a prism of ballast is inclosed in the tie at either end, and at the same time binding of the tie in the middle of the track by the hard packing of the ballast is prevented.

It will be seen by fig. 3 that it is proposed to use a special angle plate at joints. For fastening the rail to the tie elsewhere than at joints the same form of clip bolt will be used as shown in fig. 3, but the clips will be a shown in plan and elevation in fig. 1. Fig. 4 shows the washer for the clip bolt as seen from underneath.

It is proposed to make this tie in two weights, one of metal $\frac{5}{8}$ in. thick, for heavy rails, and one $\frac{1}{4}$ in. thick, for light track. The dimensions otherwise than the thickness of the metal are the same for the heavy and light ties.

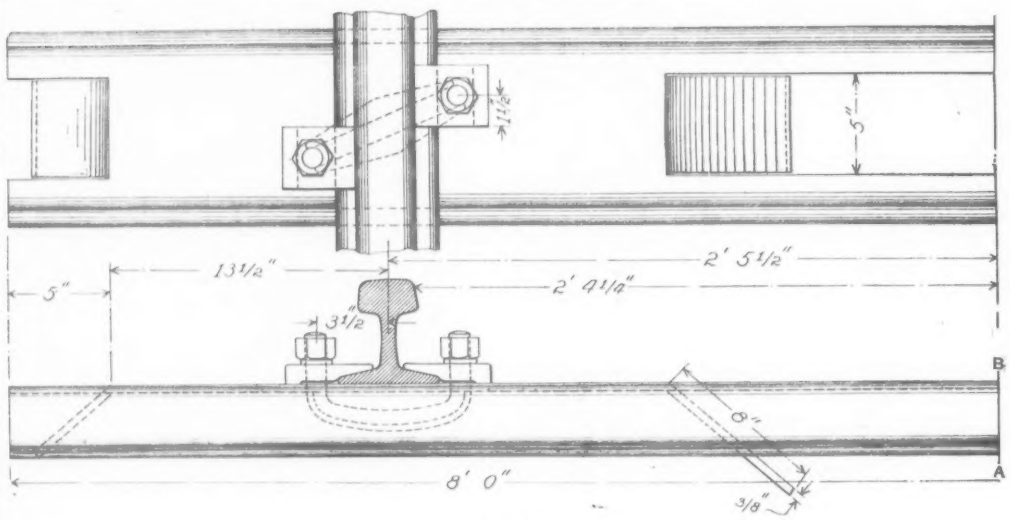


Fig. 1.

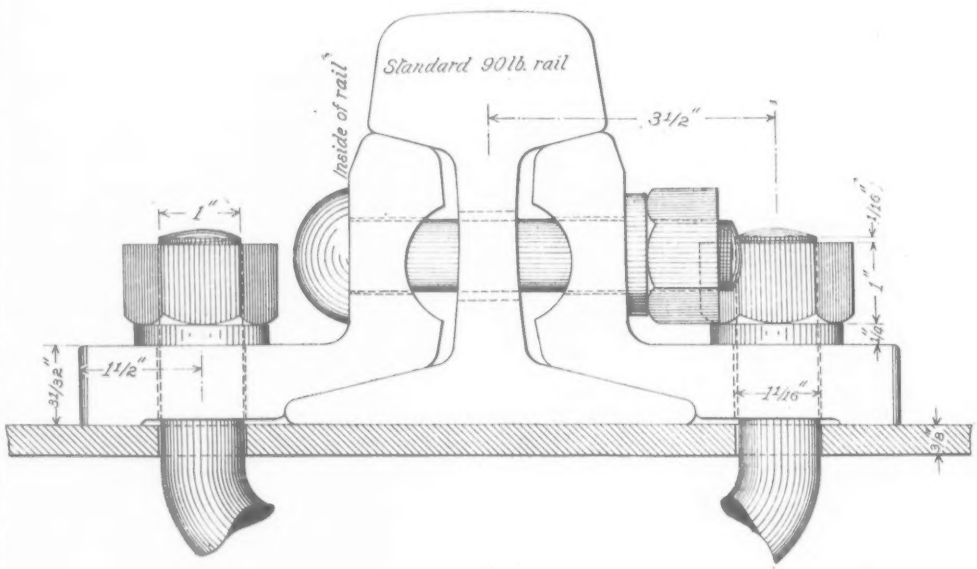


Fig. 3.

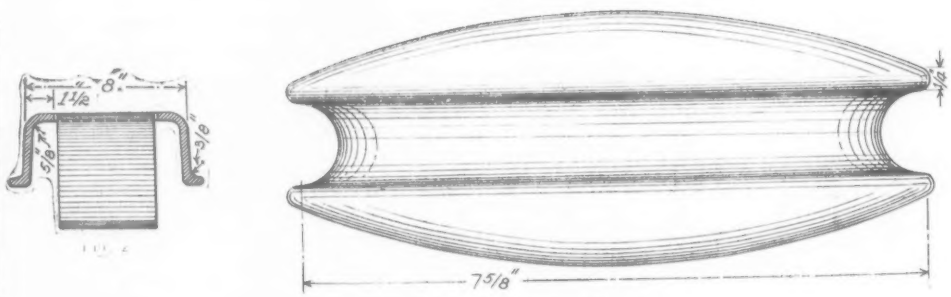


Fig. 4.

THE BONZANO STEEL TIE.

Rails and Rail Fastenings.

At the last meeting of the Superintendents' Association Mr. James Churchward read a very long paper on the subject of rail fastenings and rails. We shall endeavor in what follows to give very briefly his principal points, making merely a synopsis of his paper.

A spike driven perpendicularly with parallel sides must soon get loosened by the succession of jerks or blows caused by the passage of wheels. If a rail is kept absolutely tight to the tie the abrasion of the tie will be materially lessened, the rotting of the tie will proceed more slowly, and the tie, being raised and lowered with the rail, will keep itself tamped, and will require less shimming in the winter than if the fastenings are somewhat loose. These are some of the reasons pointed out by Mr. Churchward for the use of a better track fastening than is customary. He then proceeds to discuss various forms of spikes and bolts. Of the screw spike he says: Of itself it is very little better than a common spike to resist lateral strains, as it presents a surface against the fibres of the tie only about one half by the length of the spike. This is true enough, but Mr. Churchward ignores the fact that the screw spike is always used with a chair or with a tie plate. Naturally the conclusion arrived at is that the Davies spike is the best fastening. One of the principal points made in favor of this spike is that it is better than a brace to prevent the rolling of rails; that is, that the inside spike will not draw; consequently, the inside edge of the rail flange is held down and the outside edge cannot cut into the tie and thus create a condition that facilitates rolling.

Plates and chairs are next discussed. It is hardly necessary for us to rehearse here the argument for the use of these devices. Mr. Churchward considers a number of them which are used in European practice and were shown in the *Railroad Gazette* of Oct. 4, 1889. Concerning them he says: One cannot help being astonished at the unnecessary and detrimental weight of metal and the great number of parts. He then describes the Servis tie plate. A cut of the most recent design of this plate is given herewith, showing it in section. This

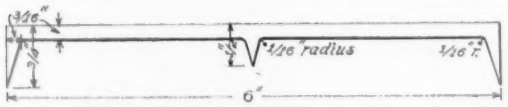


plate is 6 in. wide. It will be noticed that a flange in the metal has been added since the plate was first put on the market. Both forms are still made, the No. 1 plate, as it is called, being $3\frac{3}{4}$ in. broad, with but two flanges. An elaborate argument is then entered into showing the economy of the use of these plates, and also of the plates in combination with the Davies spike.

The second part of the paper is devoted to rail sections and joints. The first argument is to prove that a rail with a deep head does not wear as well as one with a thinner head. With this argument our readers are now very familiar. It also deals with the proposition that an increase of the width of the head gives increased contact between the rail and the driving tire, and this helps in traction. The rail proposed by Mr. Churchward is 5 in. in base by 5 in. high, the head 3 in. wide, $1\frac{1}{2}$ in. deep, and absolutely flat on top.

In the matter of joints, the conclusion is that it is absolutely impossible to make a perfect joint with splice-bars without the use of a base plate. A splice of 18 to 20 in. in length is recommended.

Regulation of Interlocked Crossing Signals in Illinois.

The following circular has been issued by the Railroad and Warehouse Commission of Illinois:

The plan and construction of interlocking, signaling and derailing devices to be used at grade crossings of intersecting lines of railroads in Illinois must be arranged to conform to the following general rules:

1. The normal position of all signals must indicate danger—derail points open—and the interlocking so arranged that it will be impossible for operator to give conflicting signals.

2. On level track, when practicable, the derail points in high-speed tracks must be placed 300 ft. from fouling point at intersection of crossing tracks.

3. On descending grades, the derail points on high speed tracks, when practicable, must be so located as to give the measure of safety equal to 300 ft. on level track.

4. The minimum distance for derail points on high-speed tracks is 300 ft. from fouling point at crossing, and no less distance from crossing will be approved, on account of ascending grade toward crossing.

5. On switching, storage and slow-speed tracks the position of derail points may be located to best accommodate the traffic, and provide the same measure of safety indicated in foregoing rules.

6. On single track railroads, derail points, when practicable, should be on inside of curve, and when double track is used the derail points should be in outside rail of both tracks.

7. Home signal posts must be 50 ft. beyond point of derail. Distance between home and distance signal must not be less than 1,200 ft. Signal post should be placed on engineman's side of track it governs.

8. In case but one derail is furnished in double track crossing, where the current of traffic is in one direction, detector bars must be provided on opposite side of crossing from derails and worked on same lever as derail, or interlocked with it, so that opposing signal cannot be given until crossing is cleared. In case trains back over crossing, after having passed over it, or if current of traffic is changed, then and in that case back-up derails must be provided.

9. Guard rails should be laid on inside of rail opposite derail, and commence at least 6 ft. toward home signal from point of derail, extending from thence toward crossing, parallel with and 9 in. distant from traffic rail, total length 200 ft., unless otherwise ordered.

10. In case there are crossovers, turnouts, or other connecting tracks involved in the general system, the movements of cars and trains upon which present an element of danger, which danger will be enhanced by the passage of trains on main tracks over crossings without stopping, and consequently at higher speed than would be the case without the permit sought, then, and in all such cases, whether such enhanced danger be of collision between different cars or trains of the same road, or between cars or trains of different roads, it will be necessary, in addition to the protection of the main crossing, to provide by the proper devices and appliances against any such increased collateral dangers in the same complete manner that is required in the case of the main crossing.

11. Application for inspection of interlocking plant must be accompanied by a plain diagram, showing location of crossing and position of all main tracks, sidings, switches, turnouts, etc. The several tracks must be indicated by letters or figures, and reference made to each, explaining the manner of its use. The rate of grade on each main track must be shown, together with numbers of signals, derails, locks etc., corresponding to levers in tower.

It is intended in this circular to state general rules, which will govern the construction of any proposed system of interlocking. The business to be handled, relative position and operation of intersecting lines, may require safeguards not mentioned herein.

The system of derailing, signaling and interlocking must be connected and worked, and be complete in each particular before it will be approved.

Charles Hansel,
Consulting Engineer.

Semaphores and Interlocking.

At the last meeting of the Superintendents' Association Mr. C. A. Hammond, secretary, read a paper with the above title. He pointed out at considerable length the great diversity in forms of signals and the less diversity to the meaning attached to various colors. Among the anomalies pointed out is that of a special signal consisting of a red target with two white disks as a stop signal by day, which is replaced by one red light at night. But some of the strangest anomalies are used to indicate the positions of semaphores by night, as, for instance, sometimes two lights placed horizontally are used to show that a home semaphore is at danger, two green lights placed vertically showing safety.

Again, a red light shows a home signal at danger, a green light shows either a home or a distant signal at safety, and a white light shows a distant signal at caution. The old and most popular form of position signal, the ball or mast head signal, shows line clear to one class of trains and danger to another class, while for the same train either one, two, three or four balls displayed may mean danger or safety, according to the location of the signal. "About the only thing the runner of a fast express train who has to pass scores of such signals can do is to take it for granted that the boys all know he is coming, and, somehow or other, have got things safely fixed for him." Mr. Hammond considers that the semaphore blade will supersede all these anomalous forms and practices, and that it will be illuminated as a night signal, thus showing with perfect simplicity and consistency and definiteness what it means at all times.

Mr. Hammond then proceeds to lay down what he calls cardinal principles of signaling. He considers that position alone cannot be depended upon at night until the illuminated semaphore is adopted, inasmuch as it would be unsafe to rely upon any special arrangement of white lights, and, on the whole, he considers that there is much to be gained by retaining both color and position, so that the horizontal *or* red signal shall mean stop and the vertical (or inclined) and white shall mean proceed.

Much stress is put upon the reliability of signals, and that the signal shall be thoroughly reliable it follows that its normal position should show danger; that it should go to its danger position in case of any defect in the mechanism; that the very fact that it stands at safety must be a proof that the apparatus is in working condition, and that the signal is one of intention and not of accident or carelessnes.

The next division of the subject taken up was the jurisdiction of signals. The principles laid down are (1) that every section of track constituting a block should have a special block signal at each end, which should be interlocked if they are to control opposite movements of trains on the same track. (2) All conflicting signals should be interlocked. (3) Each divergent route should have its own home signal. Semaphore arms which give signals to an engineman running toward them should be, on a right-handed and single-track road, seen on the right-hand side of the signal post, and on double-track roads the signal post should be placed on the outside of the track, and not between them. (5) Where several blades are placed on the same post they should indicate the tracks beyond in a regular order, the main line signal always at the top. (6) No engine should pass a danger signal. No engine should pass a caution signal unless under full control. No engine should pass any semaphore signal at schedule speed unless a distinct and unmistakable all clear signal is given. In obscure weather all semaphore signals, except distant signals, must be regarded as danger signals until known to be otherwise. The engineer must see for himself the condition of the signals.

The proper location of signals is also dwelt upon, and then Mr. Hammond proceeds to consider additional safeguards, such as derailing switches, torpedo placers and electric appliances.

In conclusion Mr. Hammond points out the necessity of replacing hand signals and judgment by mechanical apparatus. That the first step seems to be to provide a partial or tentative block system at curves or obscure places; at crossings, terminals, important yards, junctions and sidings, arranging the signals with a view to the ultimate extension of the block system. Furthermore, there should be prepared and adopted a standard signal code, in which the general principles of interlocking and signaling should be carefully elaborated and clearly expressed. Finally, he recommends that the American Society of Railroad Superintendents should establish a standing committee on railroad signaling, to which should be referred all questions pertaining to signaling, with description of important plants, etc. The reader will remember that at the convention such a committee was appointed, consisting of five active and two associate members. Of this committee Mr. J. J. Turner, of the Pittsburgh, Cincinnati, Chicago & St. Louis, is Chairman.

The Safford Automatic Drawbar.

The engraving of this coupler shows its parts and dimensions quite fully. It will be seen that the pin when lifted is held up, ready to couple, by the pallet which drops down, into the position shown, under it. When a link is thrust in the pallet is pushed back and the pin drops into position to engage in the link; thus the coupler is automatic in its action with any form of coupler carrying a link. The pin is lifted by means of a lever and chain attached to the car, the stroke of which is not sufficient to throw the pin out of its socket. Back of the pin hole will be noticed in the engraving a recess, intended for a projection or cotter pin, to keep the pin from being entirely withdrawn. This we believe is not used in the last form of the coupler, inasmuch as the lifting device cannot now lift it entirely out of the drawhead, as explained above.

An incidental advantage of this coupler over the M. C. B. coupler has been pointed out. It is this: that if an M. C. B. drawbar is pulled out there is nothing to prevent its dropping on the track, where it might be very dangerous. On the other hand, a drawbar with a link will, of course, not drop so long as the link holds.

The drawbar itself is made of malleable iron or steel, as desired. The pallet is made of malleable iron, and the pin is either of iron or steel. The form of the head, which allows room for a man's hand even when two drawheads are in contact, is well shown in the engraving.

This coupler is in extensive use. In its older forms it has been long known and very widely applied. We are told that in the form illustrated here it is applied to from 7,000 to 10,000 cars in many different parts of the country. It is especially popular in New England, where it is used on nearly all of the railroads. It is also used largely on some of the Southwestern and Northwestern roads.

The reader will probably remember that the New England Railroad Club last winter secured the vote of a large number of employés of New England railroads on the various couplers in use. This vote in detail was:

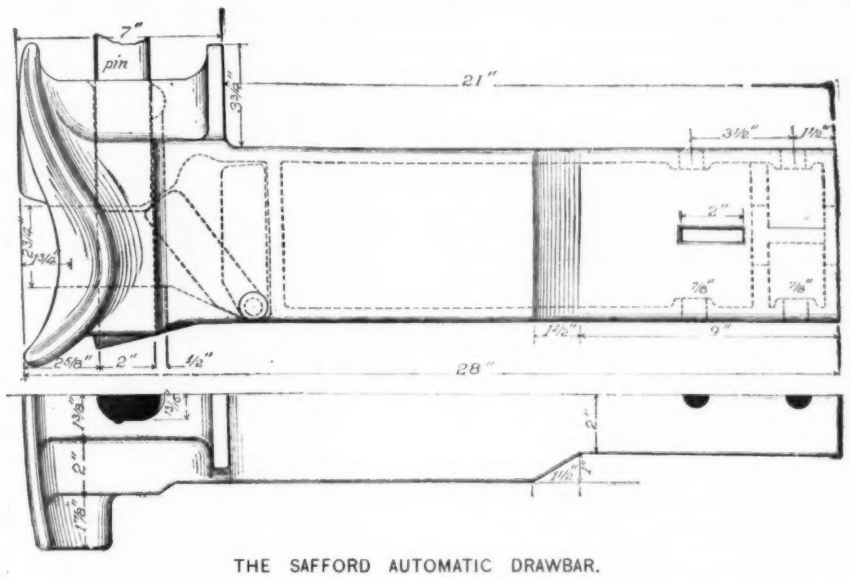
Safford	1,239	Miller	25
Janney	587	Marks	5
Common link-and-pin	63	Dowling	2
Boston automatic	30	Cowell	1
Gould	26		

Out of a total vote of 1,978 the Safford had 63 per cent. of all, and the Janney, the next highest, had but about 30 per cent. Of course, it is assumed that in this vote the Janney, with most of the voters, stood for the M. C. B. type in general, and, so far as concerns these men, it shows a very decided preference for the Safford as compared with that type. These were not switchmen alone. This is a common experience when the switchmen are called upon in a body to express themselves. At the convention of the Switchmen's Mutual Aid Association, at Buffalo, last month, the Committee on the Good and Welfare of the Order made the following report:

Therefore we recommend the adoption as a standard of a single improved draft iron link-and-pin coupler, with recess in face of drawhead for protection of hands and fingers, until some automatic coupler has been produced more satisfactory than any yet brought to our notice, which above conclusion we have reached after examining the reports on drawbars which have been submitted to us from numerous subordinate lodges.

This report was adopted by a vote of 217 to 4.

This coupler is controlled by the Safford Automatic Drawbar Co., Phenix Building, Chicago, and 1,430 South Penn Square, Philadelphia.



THE SAFFORD AUTOMATIC DRAWBAR.

The Erie's Reply to its Trainmen's Demands.

The engineers, firemen, conductors and brakemen of the Erie system who asked to have their working day reduced from 12 hours to 10, which would be, in the case of the freight men, a large increase in pay, probably 20 per cent., have received a prompt reply, signed by President John King, which is respectful and considerate in tone, and very fully justifies the road's position that it cannot afford any considerable increase in expenditure at present. The request came in the form of a revised agreement, embracing a large number of details. The engineers and firemen have had such an agreement heretofore, but it appears that the others have not. The basis on which the committees represent the conductors and brakemen does not appear. No argument was presented by the employés, and the reply quickly shows that since the last engineers' agreement (1887) freight rates have been reduced, while the wages of the men are now higher than on neighboring roads. No evidence is adduced to prove this last statement, as "the facts must be known to railroad employés generally;" but a table is presented showing that the Erie employés get the following amounts per 100 miles more than on other roads.

Passenger and freight engineers	61 cents.
Passenger firemen	41 "
Freight firemen	30 "
Passenger conductors	22 "
Freight conductors	71 "
Passenger brakemen	12 "
Freight brakemen	31 "

On the New York, Pennsylvania & Ohio

Passenger engineers receive	28 cents more.
Freight engineers	3 "
Passenger firemen	31 "
Freight firemen	22 "
Freight train flagmen	4 "
Freight conductors	11 "
Freight brakemen	The same.
Passenger conductors	40 cents less.
Passenger train flagmen	12 "
Passenger brakemen	13 "

The last three classes are promised an increase. The Chicago & Erie list shows differences similar to the others though smaller. The total proposed increase on the Erie system would be $1,034,000 a year, more than the net earnings above fixed charges; other employés would deserve a similar advance, and the total cost would be much more than a million.

The company pays by the trip. For example, from Susquehanna to Hornellsville, 140 miles, passenger trains taking four hours and freight trains taking 12 hours receive pay for 1½ days. The answer suggests that for every hour less than 10 the wages ought to be reduced. On many roads no overtime is allowed. A change making slow time advantageous to the men would not conduce to the efficiency of the service. The lack of side tracks on the Eastern and Susquehanna divisions, which causes excessive delays, will be remedied promptly.

Cordial relations have existed for many years. The company realizes its duty to be fair and considerate and its record should be a warrant that it will continue to thus treat its men; it cannot delegate its duties respecting discipline to any outside body, and cannot agree to promote and appoint by cast iron rules. The engineers demand that for every two firemen promoted an outsider shall be hired as an engineer, a proposal manifestly unfair to the other employés. Monthly passes over the entire system are asked for; this would be subversive of good discipline. The agreement proposed by the men is appended to the letter, but cannot well be considered except by comparing with the existing agreement, which is not shown.

Buildings and Structures of American Railroads.*

NO. 6.—SNOW SHEDS.

BY WALTER G. BERG.

Snow sheds are in extensive use on the Northwestern and Canadian railroads to protect the track and keep it clear in winter wherever the snowfall is heavy or bad slides are to be expected. While the use of these structures is more immediately confined to a limited section of the country, the plans adopted to overcome the difficulties encountered are of interest to a larger group of railroads, as indicative of the best general methods that can be adopted to protect a line along side hills, where slides or heavy stones rolling down the steep mountain slopes endanger the safety of trains.

While snow sheds are more particularly employed and essentially necessary in deep cuts and dangerous side hill sections of the railroads mentioned, they are also used on level ground to protect the track against heavy vertical snowfalls, which might, in the absence of such protection, cause serious blockades. We thus obtain two distinctive forms of snow sheds, namely, sheds adapted for use in through or side hill cuts, where drifts and slides might occur, and known as "valley sheds" or "gallery sheds," and sheds on level ground for protection against heavy snowfalls, known as "level fall sheds." Valley sheds are used where avalanches could strike the shed on both sides, and gallery sheds where avalanches can only come down on one side of the track.

The weight of compressed snow in a slide varies from 25 to 45 lbs. per cubic foot, and it is generally discharged in balls of varying sizes, according to the state of the weather and the condition of the snow.

Dry snow descends with great velocity, and its impact upon a structure is severe. Wet snow, on the contrary, though heavier, descends more slowly, and hence is not as destructive in its effects. Snow sheds on level ground are not exposed to slides or large masses of moving snow, and have, therefore, only the vertical snow pressure to resist. As wet snow is heavier than dry snow, the standards of the railroads vary according to the nature of the snow to be guarded against. On the the Selkirk range, Canadian Pacific Railway, the snow frequently lies 20 ft. deep on the level, requiring miles of snow sheds to be built on level ground, in addition to the usual protection in deep through and side hill cuts.

Snow sheds on level ground can be compared to wooden tunnels or galleries, having side walls of round or square timbers, sheathed with plank, and covered by a double pitched roof, with proper bracing for lateral stiffness and suitable openings for ventilation. The

*Copyright, 1890, by Walter G. Berg and condensed from a forthcoming book on the subject.

clear width is 16 ft., and the clear height above top of rail is 18 to 21 ft. The bents are usually spaced from 6 to 10 ft. apart. The standards in use for level fall sheds do not differ materially.

For deep through or heavy side hill cuts, where slides and drifts are to be encountered, a large number of standard designs exists to meet the varying conditions and different localities. As a rule, the construction consists of square or round timber bents, from 4 to 6 ft. apart, provided with heavy timber bracing or anchored with tie rods to the rock, the whole covered with a plank roof pitched according to the slopes of the adjoining hillside. Log cribs filled with stones or earth are frequently used to aid in resisting the impact of the sliding masses of snow.

The most extensively adopted design on the Canadian Pacific Railway is that of a crib built up to the level of the top of the slope on the hillside of the track, the space between the hill and the crib being filled with earth. On the other side of the track there is a framework of timbers resting on mud sills, piles or toe cribs. A properly constructed roof spans the track. Where the top of the cut does not reach up to the top of the shed, heavy embankments are thrown against the side of the shed. Descending slides on striking the embankment are deflected from their course, and pass over the shed without subjecting the timbers to serious strains.

Proper ventilation in these long wooden galleries or tunnels is secured by leaving suitable openings in the side planking and by providing louvred lanterns and air shafts where feasible. In the summer season part of the side planking is taken off, or hinged panels are thrown open, for the admission of air and light. In some cases special summer tracks are maintained outside of the sheds.

For protection against the spread of fires, the wooden siding is replaced at intervals by galvanized iron, or several sections of the shed are cut out completely. To guard against drifts or slides, split fences or glance fences are built opposite the opening, which divert the snow to the shedded sections. Special fire-service trains are kept constantly in readiness in connection with an organized fire patrol and telegraphic signal boxes along the route. In addition, pipe lines inside the sheds, with tanks, hydrants and hose reels at proper intervals, serve to complete the system.

The cost of snow sheds is placed as follows by Mr. C. A. Stoess, Resident Engineer, Pacific Division, Central Pacific Railway: The sheds protecting the track against snow slides cost from $25 to $70 per lineal foot of shed, according to location; the sheds for use on the level cost from $8 to $10 per lineal foot of shed. Mr. Thomas C. Keefer, in his paper on the Canadian Pacific Railway, read at the annual convention of the American Society of Civil Engineers in 1888, states that the typical type of snow shed in the Selkirk region, namely, a solid rock-filled crib on the mountain side and a strongly braced framework for its outer side, costs $40 to $70 per lineal foot; a gallery shed, without cribwork, but with roof extended against the mountain side, used where the impact of the snow is not severe, costs $15 to $40 per lineal foot; a combination of the typical and the gallery sheds, called "toe crib and gallery shed," where cribwork is used as a foot-wall on the mountain side, costs $27 to $54 per lineal foot.

Below will be found descriptions and plans of a number of standard designs of snow sheds in actual use:

Snow Shed on level ground, Central Pacific Railroad.—The standard snow shed on level ground of the Central Pacific Railroad, shown in fig. 1, is formed of heavy timber bents, spaced generally about 8 ft. between centres. The outside is sheathed with horizontal boards, with suitable openings for ventilation. The roof is double pitched and covered with rough boards. Louvred lanterns or air shafts are provided at intervals.

The sheds are 16 ft. wide in the clear, and 18 ft. high in the clear above top of rail. The principal timbers used are as follows: Posts, 8 in. × 10 in.; principal rafters, 6 in. × 10 in.; intermediate rafters, 6 in. × 8 in.; collar beams, 8 in. × 3 in.; brace posts, 8 in. × 10 in.

Snow Shed on level ground, Northern Pacific Railroad.—The standard snow shed on level ground of the Northern Pacific Railroad, shown in figs. 2 and 3, is formed of heavy timber bents, spaced for wet snow from 6 to 8 ft. apart, and for dry snow from 6 to 10 ft. apart. The outside is sheathed with upright boards and battens. The roof is double pitched and covered with rough boards and battens. The sheds are 16 ft. wide in the clear, and 19 ft. high in the clear above top of rail. There are two standards, one for wet and one for dry snow.

In the wet snow standard the principal timbers used are as follows: Posts, 8 in. × 10 in.; rafters, 4 in. × 10 in.; collar beams, 2 in. × 10 in.; plates, 4 in. × 12 in.; horizontal studding, 4 in. × 10 in.; siding and roofing, 2-in. boards.

In the dry snow standard the principal timbers used are as follows: Posts, 8 in. × 8 in.; rafters, 4 in. × 8 in.; collar beams, 2 in. × 8 in.; plates, 4 in. × 11 in.; horizontal studding, 2 in. × 8 in.; siding and roofing, 1 in. boards.

For bents spaced 6 ft. apart the wet snow standard requires 304 ft. B. M. lumber and 13.3 lbs. of iron per lineal foot of shed, and the dry snow standard requires 211 ft. B. M. lumber and 5.2 lbs. of iron per lineal foot of shed.

Snow Sheds over Cuts or on Side Hills, Northern Pacific Railroad.—The Northern Pacific Railroad has a large number of standards for snow sheds over cuts or on side hills to suit the varying circumstances, two of which are shown in figs. 4 and 5 from designs of Mr. C. B. Talbot.

The style of shed shown in fig. 4 is more particularly applicable in through cuts. The bents are spaced 6 ft. apart, or as may be necessary. For bents spaced 6 ft. apart, the materials required are 484 ft. B. M. lumber and 14.0 lbs. of iron per lineal foot of shed. The principal timbers used are as follows: Posts, 10 in. × 12 in.; caps, 10 in. × 16 in. over main span, and 10 in. × 14 in. on sides; brace plank, 2 pieces, 3 in. × 12 in.; roof plank, 4 in. × 12 in., and 1 in. × 4 in. battens.

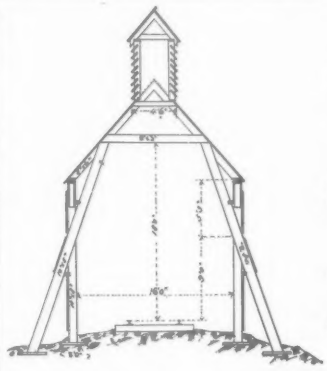


Fig. 1.

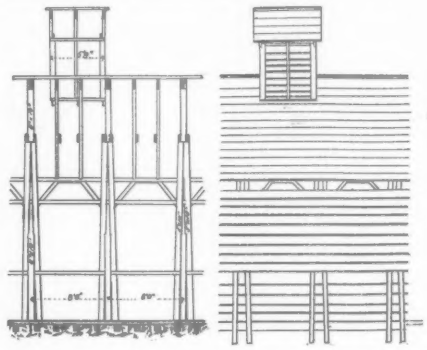


Fig. 3.

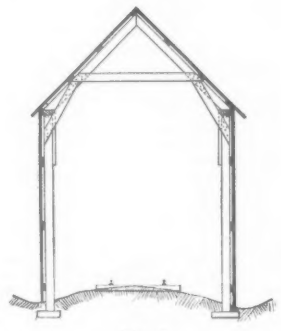


Fig. 2.

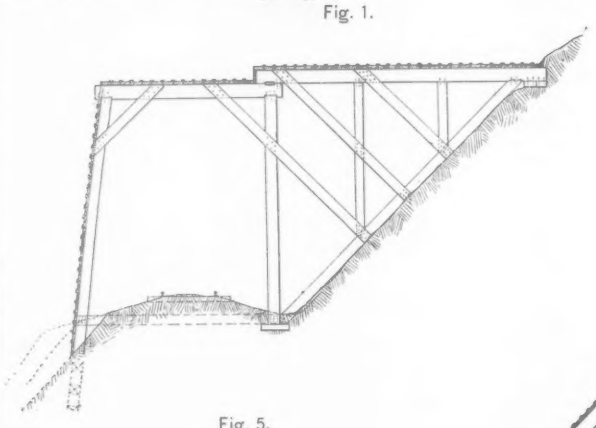


Fig. 5.

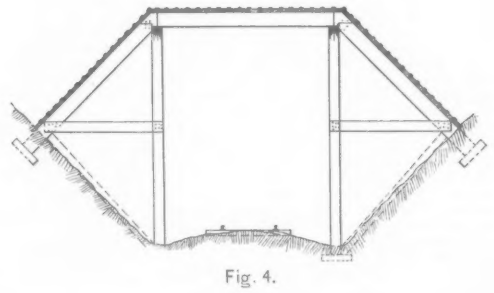


Fig. 4.

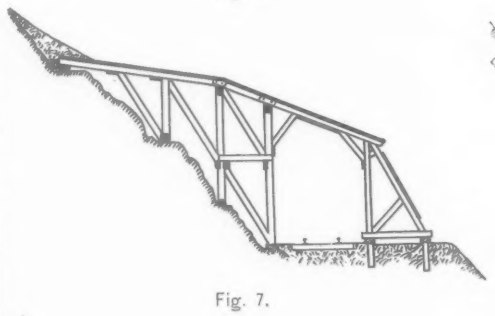


Fig. 7.

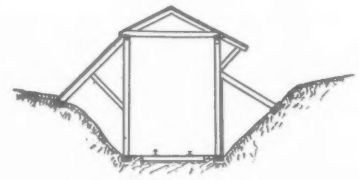


Fig. 6.

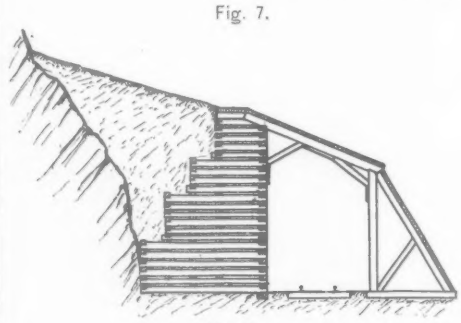


Fig. 9.

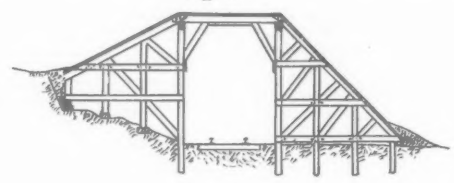


Fig. 8.

STANDARD SNOW SHEDS.

In the case shown in fig. 5, which structure is for side hills where slides occur, the bents are spaced 4 ft. to 6 ft. apart. For bents spaced 6 ft. apart, the materials required are 634 ft. B. M. lumber and 9.3 lbs. of iron per lineal foot of shed. The principal timbers used are as follows: Posts, 10 in. × 12 in.; caps, 10 × 16 in. over main span, and 10 in. × 12 in. on sides; bank sill on outside at foot of posts, 10 in. × 12 in., continuous from bent to bent; mud sill up slope of side hill, 10 in. × 12 in.; brace plank, 2 pieces, 3 in. × 12 in.; roof plank, 4 in. × 12 in., and 1 in. × 4 in. battens.

The space left for the track is in all cases 16 ft. wide in the clear, and 19 ft. high in the clear above top of rail.

Snow Sheds, Canadian Pacific Railway.—The Canadian Pacific Railway has a very large number of snow shed standards, as built at different times under varying conditions. Four of these standards are shown in figs. 6, 7, 8 and 9, the last of which has been most extensively employed. The clear space left for the trains in all the standards of the road is 16 ft. wide and 22 ft. high above the grade line.

The design shown in fig. 6 is for use in through cuts, and for protection against level fall. The bents are spaced 8 ft. apart. The principal timbers used are as follows: Posts, of round timbers; plates, 8 in. × 10 in.; rafters, 9 in. × 12 in.; brace posts, 6 in. × 8 in.; roof plank, 3 in.

In fig. 7 a design is shown for use in through or side hill cuts. The bents are 8 ft. apart. The principal timbers used are as follows: Posts, of round timbers; plates, 10 in. × 10 in.; caps, over main span, 12 in. × 15 in., and on sides, 12 in. × 12 in.; roof plank, 4 in.

Fig. 8 shows a design for use in through and side hill cuts. The spacing of the bents and the general sizes of the timbers are similar to those in the last described design.

The standard, shown in fig. 9, deserves more than passing attention, as it is the type of snow shed at present in favor on the Canadian Pacific Railway for use on side hill and through cuts where heavy slides can be expected. A crib is built up to full height of the top of the cut on the hill side of the track, the space between the crib and the hill being filled with earth. On the lower side of the track a framework of 12 in. × 12 in. timbers or round logs, resting on sills, piles or a toe crib, supports the lower end of the roof over the track. The crib is formed of 12 in. × 12 in. or 10 in. × 12 in. front logs and round back logs, spaced with 3 in. openings. The front and back logs are connected by 8 in. × 8 in. square, or by round log ties, spaced 5 ft. apart, dovetailed to the front logs and saddled or dove-tailed into the flatted back logs. The roof plank is 6 in. thick. The timber work throughout is only drift bolted or doweled together; no mortises or tenons are used.

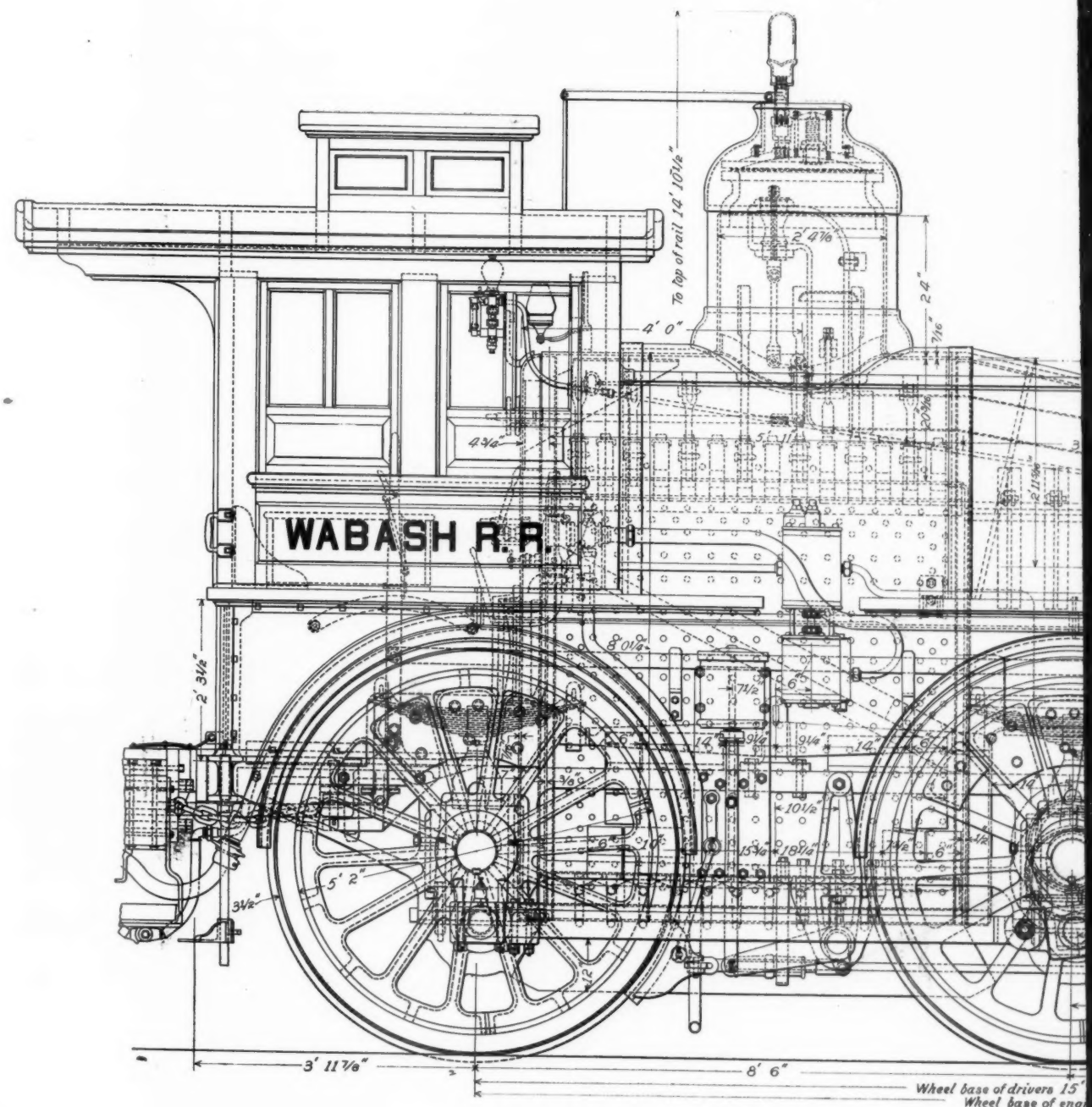
For additional standards and data see the *Railroad Gazette*, issue of July 6, 1888, and Transactions of the American Society of Civil Engineers, August, 1888, with paper on the Canadian Pacific Railway, by Thomas C. Keefer, president of the Society.

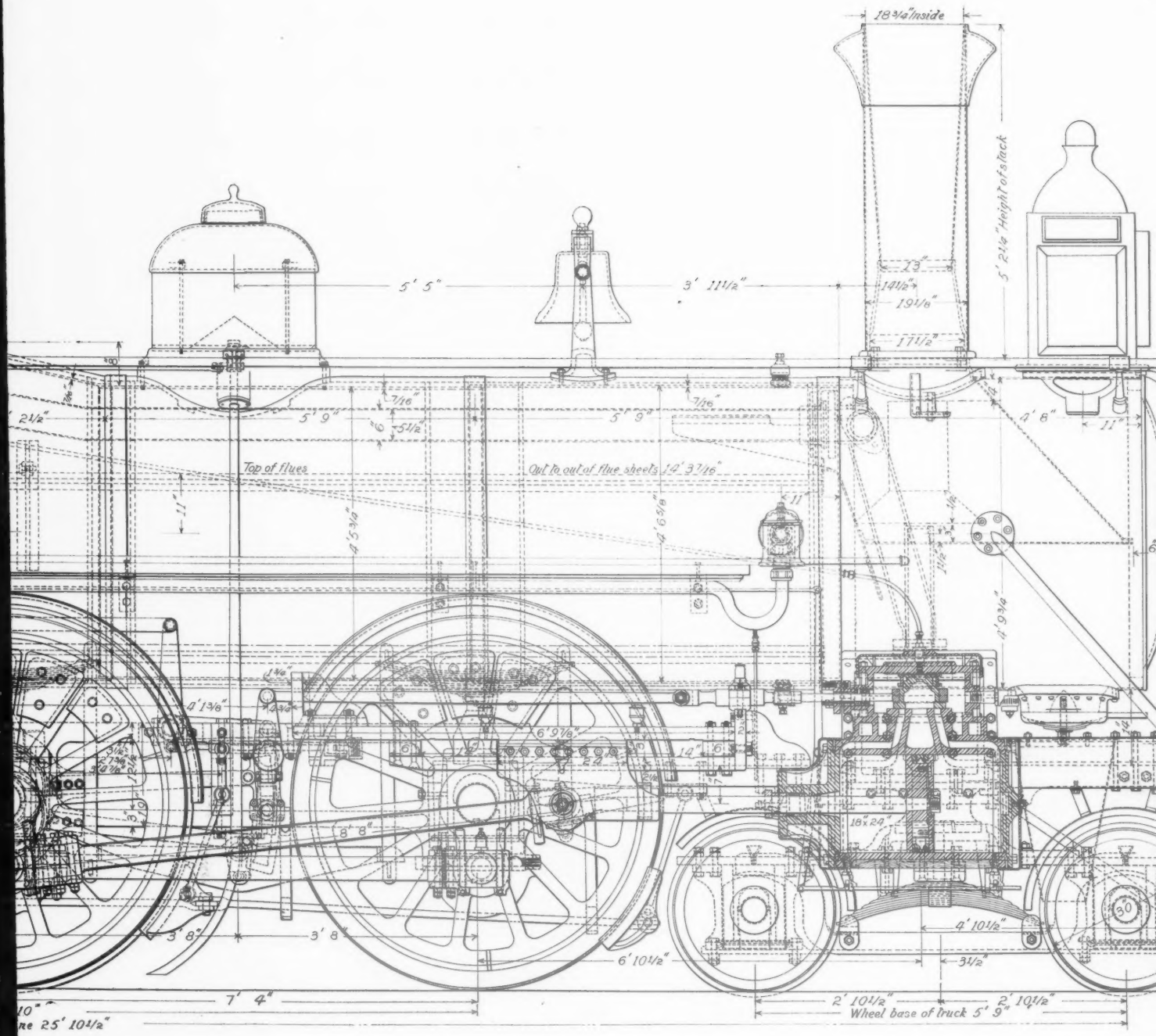
The Transandine Railway.*

Satisfactory progress is being made with the work of connecting a series of railways across South America, and joining the River Plate with the Pacific coast of Chili, commenced some time ago by Messrs. J. E. and M. Clark & Co., Dashwood House, New Broad street, E. C. It is only possible to appreciate the magnitude of the undertaking when one realizes that mountains, clad with perpetual snows, are to be pierced by tunnels over 10,000 ft. above the sea; that the only approach being by mule tracks, impassable for six months in the year; and that food, material, and machinery have to be carried four days' journey on the backs of mules.

The railway will, when completed, form the connecting link in the transcontinental railway between Buenos Ayres, the capital of the Argentine Republic on the Atlantic coast, and Valparaiso, the chief seaport of Chili on the Pacific coast, and unite the railway systems of the two most important republics in South America. Fig. 1, an outline map of South America, shows the general line of the transcontinental railway. In the sectional map (fig. 2) the link connecting the existing railways is shown by a heavy line, while fig. 3 shows the line in detail, the distances being

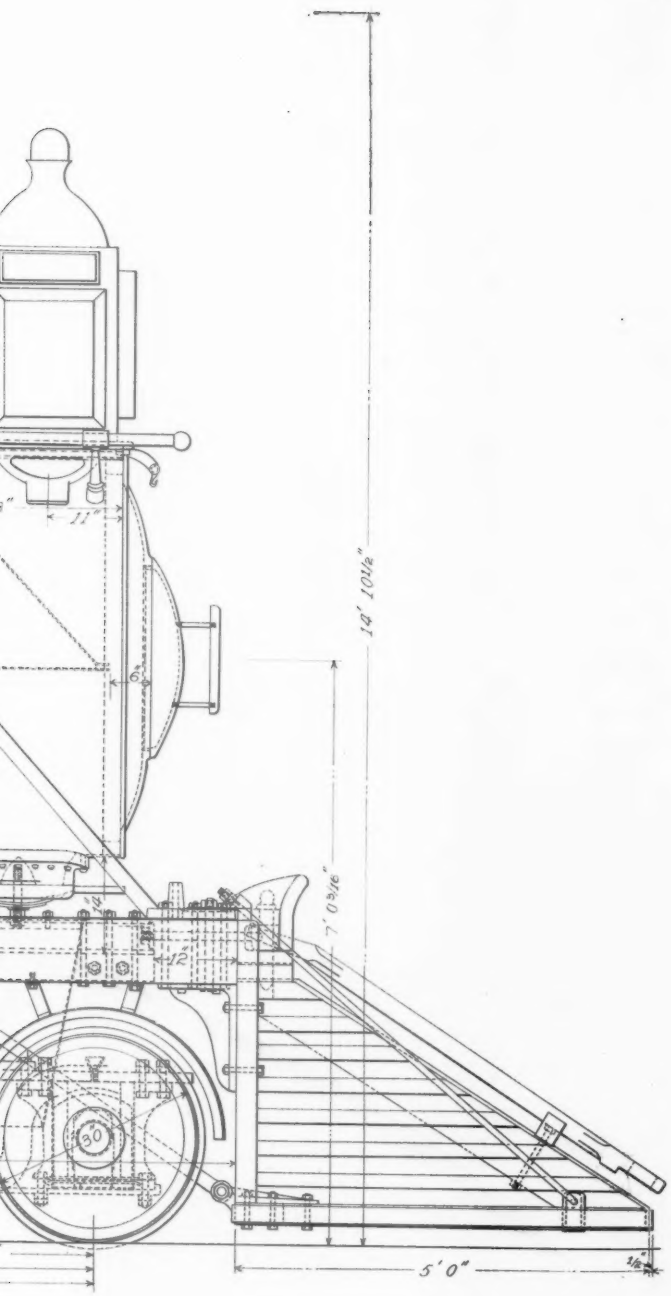
*Condensed from *Engineering*.


WABASH R.R.
To top of rail 14' 10½"
4' 0"
2' 4⅞"
24"
7/16"
4¾"
2' 3½"
8' 0½"
7½"
14"
9¼"
9¼"
14"
10½"
15⅛"
18⅛"
7½"
5' 2"
3½"
3' 11⅞"
8' 6"
Wheel base of drivers 15'
Wheel base of engi

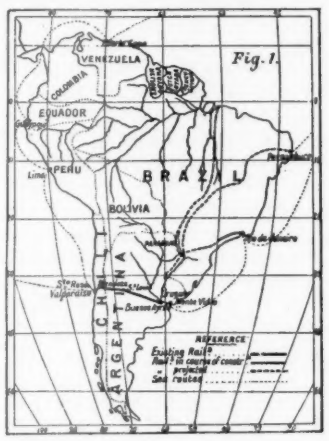


TEN-WHEEL EXPRESS LOCOMOTIVE—WABASH RAILROAD.

MR. J. B. BA



MR. J. B. BARNES, *Superintendent of Motive Power and Machinery.*



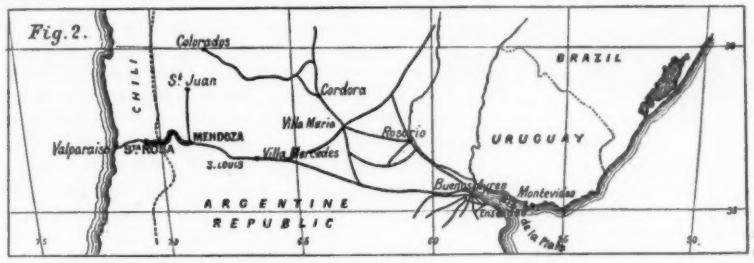


Fig. 3.

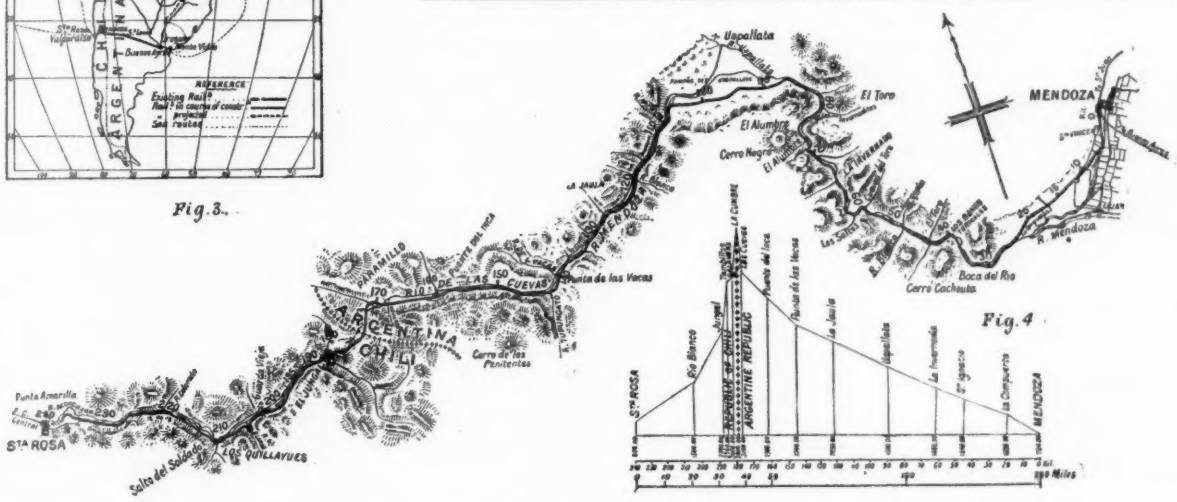


Fig. 4

THE TRANSANDINE RAILWAY.

marked in kilometers. The distance between Buenos Ayres and Valparaiso by trancontinental railway will be about 850 miles, of which 757 miles are in Argentine and 93 miles in Chilian territory. The whole of the Argentine section was included in the original concession to Messrs. Clark, but 220 miles from Villa Mercedes to Mendoza were constructed by the government; they were subsequently bought by Messrs. Clark, and now form the Argentine Great Western system. The 428 miles from Buenos Ayres to Villa Mercedes were built by Messrs. Clark, and now constitute the main line of the Buenos Ayres & Pacific Railway. Both these lines have a gauge of 5 ft. 6 in., the standard broad gauge of the country. The remaining 109 miles from Mendoza to the frontier are under construction and form part of the Transandine Railway.

On the Chilian side the distance from Valparaiso to the frontier is 93 miles, of which 53 miles to Santa Rosa are built to the 4 ft. 8½ in. gauge, and have been worked for some years by the Chilian government, leaving 40 miles from Santa Rosa to the frontier, which are now under construction by Messrs. Clark.

Messrs. Clark have therefore the whole of this mountain railway in hand, 169 miles on the Argentine side which they are constructing for the English company, called the Buenos Ayres & Valparaiso Transandine Railway Co., Limited, and 40 miles on the Chilian side, called Clark's Transandine Railway, which they are constructing on their own account, making a total length of 149 miles, the whole of which is of a mountainous character, presenting engineering difficulties of an exceptional character.

The starting point, Mendoza, is 2,376 ft., and the terminus, at Santa Rosa, 2,704 ft. above sea level. The lowest pass between these points attains an elevation of 12,467 ft. above sea level, or about 10,000 ft. above the termini. Fig. 4 is a profile showing the altitudes at several points of the railway. These altitudes are given in meters, and the distances in kilometers; but in the latter case we have given the equivalents in miles.

A careful survey showed that to carry a surface line, with gradients that could be worked profitably by adhesion, would entail a considerable development, adding materially to the mileage without providing any security against snow and avalanches. It was, therefore, decided to adopt the Abt rack system, with 8 per cent. gradients for a portion of the line, and to carry the line in tunnels for a considerable distance in those portions where snow and avalanches had to be encountered; and at the summit, where 2,000 ft. in altitude could be saved, by a tunnel three miles in length. It has been finally arranged that the first 84 miles of the line from Mendoza are to be constructed with gradients not exceeding 2½ per cent., worked by adhesion. The locomotives to be used in the remaining 65 miles will be constructed so that they can work either by adhesion or by the use of toothed wheels, thus enabling short sections of rack to be introduced where required. The longest section of rack, which will be about 10 miles, will be at the summit.

The first important bridge on the line is at the 15th mile, where the Mendoza River is crossed by a viaduct of six spans of 66 ft. each. It is not, however, until the Boca del Rio is reached at mile 19 that the railway actually enters the gorge formed by the River Mendoza, and commences the ascent of the Andes. From this point heavy works begin, broken here and there by the pampas. After entering the gorge, by a series of heavy cuttings and a short tunnel, the line again crosses the Mendoza by a deck bridge of 148 ft. span and re-crosses it again at the 23d mile by a bridge of 131 ft. span, and reaches the station of Cacheuta at mile 24. Leaving Cacheuta the Mendoza is crossed again by a bridge of 148 ft. span; a deep cutting and tunnel are then passed, and the line follows the left bank of the river.

At mile 30 the river is crossed for the fifth time by a through bridge of 246 ft. span, and the line passing over the Paramillos Plain enters a tunnel and follows the right bank to mile 34, crossing the river by another bridge of 246 ft. span. From this point to Uspallata Station, mile 57, the railway crosses the river three times, twice by spans of 246 ft., and once by a span of 197 ft. Beyond Invernada, which is 4,593 ft. above sea level, and at mile 38, several tunnels are passed before reaching the valley of Uspallata, 5,577 ft. above sea level.

At Uspallata there are extensive silver mining works, and at present the products are being conveyed on mules to Mendoza and thence by railway to Buenos Ayres for shipment to Europe.

From the junction of the line with the existing railway to the Rio Blanco, a distance of 84 miles, the gradients will not exceed 2½ per cent., with minimum curves of 263 ft., but from this point to the summit tunnels, a distance of 20 miles, several short lengths, amounting in all to about two miles, of rack rail have been introduced with a maximum grade of 8 per cent. and minimum curves of 656 ft.

Following the valley of Las Cuevas, the first of the series of tunnels leading up to and piercing the main ridge of the Andes is reached at a point 9,515 ft. above sea level. This, the Navarro No. 1 tunnel, will be 755 yds. in length, with a maximum gradient of 8 per cent. The Navarro No. 2 tunnel will be 820 yds. long, and also on a grade of 8 per cent. Immediately after leaving this latter tunnel the railway will enter the Las Cuevas tunnel, 930 yds. in length. The maximum grade in this tunnel will be 6½ per cent. From the mouth of the Las Cuevas tunnel the railway continues in the open, with a gradient of 5 per cent., for a distance of 1½ miles to the mouth of the summit tunnel, and here the line has been laid out with great care to avoid all danger from snow and avalanches.

The highest point in the railway is reached about the centre of the summit tunnel at an altitude of 10,466 ft. above the level of the sea, 5,540 yds. in length, with a maximum grade of 8 per cent. After leaving this tunnel the railway will immediately enter the Calavera tunnel, 4,100 yds. in length, followed by the Portillo, a double-turn spiral tunnel, 1,840 yds. in length, and again proceeding, still in tunnel, through the Juncalillo, 1,395 yds., and the Juncal, 1,207 yds. in length, with a maximum grade of 8 per cent., to El Juncal, the first station on the Chilian side, 118 miles from Mendoza and 31 from Santa Rosa and 7,218 ft. above the Pacific.

Upon the Chilian side of the Andes about 12 miles of rack will be used, with a maximum gradient of 8 per cent. Upon the portions worked by adhesion the gradients will not exceed 2½ per cent.

The Abt system of rack railway will be used. The locomotives, which are being built by Messrs. Beyer, Peacock & Co., will be constructed with two pairs of cylinders, one pair to work the adhesion wheels and the other pair the rack pinions. They will be carried on eight wheels, four of which will be coupled, the leading pair of axles being rigid, and a two-wheeled bogie behind. The locomotives in working order will weigh about 45 tons and be capable of hauling a train of 70 tons gross upon the maximum grade of 8 per cent. That portion of the railway between the commencement of the rack upon the Argentine side and its termination on the Chilian side will be worked by these combined rack and adhesion locomotives. There will be about 10 miles of continuous rack, and 7 miles distributed in short sections with lengths worked by adhesion between. The locomotives supplied to work the portion of the line where there is no rack, which makes up the first 84 miles, are six-wheel coupled tank locomotives upon 10 wheels, the weight upon the coupled wheels being 28 tons. These engines will draw a train of 140 tons gross upon the maximum adhesion grade of 2½ per cent.

The Transandine Railway is laid to a gauge of 1 meter. The rails upon the adhesion portion are of steel, 50 lbs. per yard, but the portion of the line over which the combined locomotives will run will be laid with rails of 55 lbs. per yard with angle fish-plates. Hardwood sleepers will be used except where the rack rails are laid.

There is every prospect that at least two-thirds of the line will be opened to public traffic before the end of the year, and to the mouth of the summit tunnels in the following year, when also the line on the Chilian side will be completed to the tunnels, so that with the exception of the cutting in the summit tunnels, the railway will be continuous, and, if the intervening distance is covered by a short journey over the mountains, traffic can be carried on between the two countries. All the tunnels are expected to be completed by the end of 1893. Headings have been commenced at all faces, and good progress has been made by hand labor. The drilling plant is now on the ground.

As the cost of fuel would have been great and there was not sufficient water power close to the entrances to the tunnel, it was decided to utilize the water found in the valley below, and as the approaches from these valleys are steep and rugged, it was considered advisable to transmit the power by electricity. Two chief installations have been made, one on the Argentine and the other on the Chilian side of the Andes, the larger being on the Chilian side. Here a head of water of 600 ft. can be obtained, and on the Argentine side a head of 400 ft. is available. As it was only possible to convey the machinery on the backs of mules, it was necessary that it should be light, while the sharp corners of the mountain paths had also to be taken into account. The weights of cast or wrought-iron pipes made it advisable to use steel pipes, and with the view that all material should be interchangeable, two 20-in. diameter steel pipes were adopted upon the Chilian side and one of the same diameter upon the Argentine side, the thicknesses of the pipes being graduated according to the pressures at the different portions of the conduit. These pipes have stamped and angle-iron flanges riveted on, and they are bolted together with a wooden hoop between to make a water-tight joint.

The water thus obtained at considerable pressure is used for driving the turbines, which are of the Girard type. On the Chilian side there will be 12 turbines each of 80 H. P., working at 700 revolutions per minute. Each turbine will drive directly on its shaft a dynamo giving 135 ampères at 400 volts. From this installation cables carry the power to two secondary stations. The power is conveyed to Juncalillo, about two miles distant, by four copper cables, carrying the power from six of the dynamos to six 60 H. P. motors, while two cables are employed to carry the power of four dynamos to four 60 H. P. motors at Calavera. In each case the motors, which make 600 revolutions per minute, drive air compressors, capable of compressing air to six atmospheres. On the Argentine side, where the means of transport are more difficult, it was found impossible to reduce the various parts of the machines to such weights as could be carried. Double the number of dynamos, and motors of half the power had therefore to be substituted at considerable increase in cost. The power from this installation will be carried about two miles by four copper cables to Las Cuevas. The electrical cables, made by Messrs. Siemens, are of three sizes, each containing 19 pure copper wires of different diameters. They are covered with a special insulating preparation and encased in lead, and further protected by an outer covering of plaited jute. The shafting for transmitting the power from the motors to the compressors is of steel, 3 in. in diameter, and is driven at 300 revolutions per minute, the compressors, which are on the dry air system, making 180 revolutions per minute. The air is received from the compressors into large steel reservoirs, from which it is carried to the drills by 4½-in. lap-welded wrought-iron piping with removable cast-iron flanges, and jointed with rubber rings. The rock will be perforated by Ferroux drills, six drills being fixed on each carriage, which will run upon a portable railway of 2 ft. gauge. The Ferroux system of air perforators has been adopted in preference to the Brandt or other hydraulic systems, chiefly on account of drainage and ventilation, and the danger of the water freezing in the pipes where they are exposed outside the tunnels. In addition to the Ferroux drills several Ingersoll drills have been supplied for work on the minor tunnels. The débris will be removed chiefly by gravity, using a continuous wire rope, with strong brake power and grip pulleys. Six air winches, each of 6 H. P., have been supplied for hauling the drill carriages up the steep gradients, and for hauling the spoil wagons where gravity cannot be employed.

Lake Ore Shipments.

The *Marquette Mining Journal* reports shipments for the week ending with the 8th inst. as 264,904 tons; but the strike of 2,000 men at the Ishpeming mines will materially cut down shipments from the Marquette range for the balance of the season. Up to the date mentioned the shipments have aggregated 6,745,542 tons, an increase of 1,071,221 tons, or nearly 20 per cent., on the shipments of last year at the same date.

RAILROAD GAZETTE

Published Every Friday,
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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

An important order affecting the use of vertical plane couplers has recently been issued by some of the Eastern roads. As the order has been misunderstood and misrepresented, we give the sense of it. It is that no car with a broken coupler or with a broken or missing knuckle shall be received even if it is carded. This order has been issued by the New York Central, the Delaware & Hudson, the Boston & Albany and the Fitchburg. It is said that the Erie will take the same position.

We give more than usual space this week to the report of the meeting of the New England Railroad Club because it is more than usually interesting. Under the general head of steel-tired wheels enough separate topics were brought up to fill several evenings, and it is a matter of regret that the discussion was spread out so thin and that more figures were not introduced. For instance, the figures of the relative cost of service from chilled and steel-tired wheels would have been of great interest to many railroad men. It is by no means proved to the satisfaction of all the most intelligent chiefs of rolling stock departments that steel-tired wheels are cheaper even on long run cars, or in fact as cheap. Comparative figures of cost of service would have added much to the value of the discussion. Still the discussion is important as giving the opinions of well-posted men on a variety of subjects and as summing up a good deal of experience, and we are especially glad to see a lift given to the Ross form of brake shoe.

The Erie's reply to its trainmen, summarized in another column, very fully covers the case. The men's demand was doubtless formulated without any great excitement, and perhaps without much forethought; and they will, so far as now appears, accept the result gracefully. The newspapers have "slopped over" some, as they did in the Central strike, the space writers evidently deeming it necessary to employ the word "strike" and the familiar cognate phrases, even when they could only print a lot of guesses and at the close of the paragraph say that they had probably guessed wrong. There was at no time any evidence of a pronounced unreasonable spirit on the part of the men. The men made a mistake in lumping passenger and freight facts together and gave the company a good point against them. The company made no mistake in its arguments except perhaps in being too considerate. The preposterous demand for season passes over the entire system merited a sharper rebuke. The company ought to maintain its discipline and keep its trainmen within reasonable calling distance when off duty, even if they each had annual passes all over the United States; and it is not certain that withholding the passes will keep them at home; but yet that demand is none the less "cheeky" and deserving of refusal. Still more impudent is the demand that only two-thirds of the deserving firemen be promoted—that is what it amounts to. It is amusing to observe the exactly opposite stand taken by the conductors, that *no* outsiders be employed. Evidently this alliance between engineers and other trainmen is not of the most intimate nature.

But the most important point of all, that "any arrangement making slow time advantageous to the men is detrimental to the service" is not enlarged upon by Mr. King. This embraces the principle that piece work will always in the long run be performed more faithfully than time-work, and no road can afford to disregard it. It is of vital interest to a railroad company, aside from the mere question of wages, to have all its trains moved with promptness and at the highest speed consistent with safety, economy, and due regard to wear and tear of rolling stock: and the most effective way to make the trainmen appreciate this point and carry it out is to make it for their interest to reach their destination early. It is true, as Mr. King says, that some roads pay no overtime whatever; and this is also true, as our readers may recollect, of at least one road of considerable importance. Of course there are difficulties on a large road, crowded with traffic, that are not met on a smaller line; and the problem on a system like the Erie is not to be solved in a day; but the Erie has some of the very best talent in its operating department, and it is a pity that it cannot present to its men a scheme by which they can earn more money in fewer hours, while still giving better service to their employer. Assuming that the company has paid, say, $5 overtime for each $100 at trip rates, why not offer to increase the trip rates 5 per cent. and abolish overtime? As we have just intimated, the experiment would have to be tried cautiously, and would have its drawbacks; but the success of the principle in smaller affairs warrants its consideration for larger ones. This idea is antagonistic to the brotherhood idea of putting the best workers on a level with the poorer, and would be correspondingly distasteful to agitators and all whose chief aim is to get good money for poor work; but the Erie has issued a document which relies for its force upon justice and common sense, and a proposition of the kind we have suggested could only add to those grounds of strength.

Certain rules governing the arrangement of interlocked signals at grade crossings are given on another page. They are issued by Mr. Charles Hansel, Consulting Engineer to the Illinois Railroad and Warehouse Commission. We have a little fault to find with the rules, but probably it will be said that our remarks are uncalled for as the rules are general, and are not made to cover all special cases, and that brevity was aimed at particularly. In rule 2 it is provided that the derail shall be "300 ft. from the fouling point at the intersection of crossing tracks." The position of the derailing switch should be governed somewhat by the angle at which the tracks intersect. If this angle is very acute, the fouling point would not be at the intersection, but some distance (greater or less) before the crossing is reached. In such a case a train running at high speed might pass the fouling point after it was derailed if the derailer was not more than 300 ft. from the intersection. Again, at an acute crossing of double tracks it might be necessary to derail a train on the side toward the track crossed, which would move the fouling point still further back. In fact, in such a case it might be inexpedient to use a derailer at all. Probably this is a special case which it is not intended to cover by the rules, and very likely it is not intended to say that the fouling point is *at* the intersection. Rule 7 provides that the home signal should be placed "50 ft. beyond the point of derail." Probably it is intended that a train approaching the crossing should get to the home signal 50 ft. before the derailer is reached; but this meaning is not definitely expressed. Certainly it would be inadmissible to put a home signal 50 ft. *beyond* the derail, using the word beyond in its natural sense as determined by the direction in which the train is moving. Doubtless this is simply an instance of want of precision in the language of the rules. From rule 8 we infer that it is the intention that detector bars should be used with all derailing switches, but it is only an inference. Certainly they should be. It would be better not to use derailers at all than to use them without detector bars.

Rate Making and Rate Maintenance.

"These are separate matters and should be so treated." This is the burden of a letter addressed by Mr. Walker to the railroad presidents in connection with his call for a meeting at Chicago this week. We fear that the presidents are hardly ready to act; but we are glad to have the subject brought up in the vigorous way in which Mr. Walker presents it.

Of rate making he says:

> I am thoroughly convinced that the roads should discard independent action in initiating competitive rates, should relieve their traffic departments from the responsibility of making rates, and should put the whole subject of their establishment in the hands of a central agency, responsible directly to the presidents and directors of the associated lines. In other words, I believe that the several boards of directors should resume the duties in this respect which they have allowed to drift into the hands of their general freight and passenger agents and rate clerks; and by concurrent action should place the exercise of this important function in the administrative control of a small, general rate committee, standing between the traffic departments of the roads on the one hand and the public on the other, and subject only to supervision by the various boards of directors, which are, by law, responsible to their stockholders and the public for the establishment of railway tariffs. Unless something of this kind is done railway managers will presently be chiefly receivers.

On the subject of rate maintenance his words are equally strong:

> No one has yet suggested a way in which railway rates can be maintained, and unjust discrimination controlled, without providing some form of compensation for cases where necessity demands it. The way in which this has been heretofore effected throughout the world, where railway competition is permitted to exist, is by a pooling of earnings. This the law forbids. Meanwhile the division of the traffic itself has been suggested as a basis upon which rates may be maintained; its feasibility is as yet experimental, but it seems to be the last resource; it offers a fair expectation of present though, perhaps, temporary relief. I am still of the opinion that it would be well for the roads to seriously consider the question of placing their entire joint traffic to and from their eastern connections in charge of a common agency. A single individual could be designated to act for all; or a corporation or a joint stock company could be readily organized with which each western road might contract to do the work of its present eastern agencies, in the receiving and forwarding of freight; very little, if any, change would be required in the methods now employed, except the discontinuance of line soliciation; enormous expenses could be lopped off; and a block of readily divisible traffic would be created, ample for the purpose of equalization and easily protected against outside competition.

In one respect we are disposed to go further than Mr. Walker. It is not enough to treat the two separately. The second must be treated first; or, at any rate, the relative importance of the second must be fully appreciated. This is what past agreements and associations have often failed to do: it is, we fear, what the presidents will leave undone this time also. In almost every case there has been a tendency to overvalue machinery for rate making and undervalue that for rate maintenance. Especially is this true of men who look at railroad matters from the financial side. The Interstate Commerce Railway Association was organized by such men and with such ideas; how conspicuously it failed to accomplish its object we know only too well. If the presidents act on the first of Mr. Walker's ideas and neglect the second they will repeat the blunders of the past. The possibility of wise rate making by the higher officials depends upon the possibility of rate maintenance by the lower ones. In this respect the former is subordinate to the latter. Until this fact is recognized we cannot hope to have anything like systematic rates.

Let us see how the matter habitually works at present. Several railroad presidents or traffic managers agree upon a fair rate, high enough to be remunerative. A local agent of one of the lines takes business away from the other lines by secret concessions to shippers. What is to be done by the roads which suffer such loss? There are four alternatives:

1. To let the competitive traffic go. This is, in the majority of instances, wholly out of the question.

2. To demand a readjustment of differentials. This takes time, and meanwhile the roads which maintain rates suffer severe loss of traffic. Even after the readjustment is made it does not prevent the same difficulty from repeating itself right off.

3. To meet secret rate cutting by open reduction in rates. This has the practical effect of taking the rate making power out of the hands of the higher officials and putting it into the control of local agents; in other words, it is exactly what Mr. Walker and the presi-

dents both deprecate. But, bad as it may be, it is better than the only remaining alternative.

4. To fight the devil with his own weapons and meet secret rate cutting on one road by secret rate cutting on the others. This is in violation alike of law and of public policy; but it is what we not infrequently come to where the first alternative is suicidal, the second useless, and the third prohibited by superior authority.

An agreement as to rates, without some arrangement for division of traffic, stands thus at the mercy of the most reckless agent of the most unscrupulous road. Even if the others really desire peace, they cannot well escape the alternative just described, except in those seasons, none too common, when there is more than enough traffic for all the roads concerned. Without such division of traffic, the effort to avoid open rate cutting only results in secret rate cutting; a thing scarcely less unfortunate in its direct effect upon the revenue of the companies concerned, and vastly worse in its indirect effects both upon the railroads themselves and upon the public at large.

Black Hand and Barnesville.

The collisions at Black Hand, O., on the 28th and one at Barnesville, on the same road (the Baltimore & Ohio), the same day were discussed by the newspapers in connection with the collision near Mauch Chunk, Pa., the three occurring about the same time and being all due to the negligence of employés. We discussed the last named disaster in our last issue, but preferred to wait before speaking of the others until more particulars were available. As some of these are of general interest, we print them even at this late date. At Black Hand, a bad butting collision between freight trains killed five employés and two trespassers who were on one of the trains. The immediate cause was the failure of an operator to deliver an order which was sent to him for one of the trains; and the principal warnings to be found in this collision are similar to those spoken of in our last week's article. But here, as at Mauch Chunk, the dispatcher as well as the operator disregarded a plain rule. The Baltimore & Ohio forbids dispatchers to run an inferior train against a superior when the latter is held only by a holding order which has been acknowledged by an operator. They must call on one or more reliable employés to sign the order with the operator, and in addition to this must have torpedoes placed on the rail. This rule was disregarded, although there was, we understand, ample opportunity to comply with it.

A correspondent in writing to us about this collision refers to the fact that the Standard Code would not have prevented it, and inferentially justifies the Baltimore & Ohio for not adopting that code.

No one has ever claimed that the Standard Code would enforce itself. Obedience to orders and properly maintained discipline are necessary under that as well as under any other code of rules. We have urged the adoption of the Standard Code largely on the ground of its good form and its careful omission of superfluous matter, and we have asked assent to its good features only where they are proved good. Take, for instance, rule 510, which covers this case. Any road could adopt the code and omit from this rule the words "whenever practicable," while at the same time meeting every point that we have ever urged in favor of the code. The Baltimore & Ohio's rule may be regarded as stronger than rule 510 as it stands. But to this we do not object; and, in fact, the B. & O. is not the only road that strengthens this rule. The Allegheny Valley, as our readers will remember, never runs an inferior train against a superior without first getting signatures from the latter to some kind of an order. This was told of in a communication to the *Railroad Gazette* of Jan. 20, 1888, and a similar practice by a Southern road was reported by another correspondent Feb. 17 the same year. We will not now discuss the precise merits of these auxiliary rules, but simply call attention to the fact that we make no objection to the general principle implied by their use.

No one claims that the Standard Code is perfect. We simply urge that it be used as a basis, that additions and excisions be made with care, and that its imperfections be not used as an excuse for delaying all action. It may be well, however, to refer here to an objection which many people would at once bring against the B. & O. rule, that an operator who would forget to deliver an order would be careless in getting the additional signature, or might even resort to deception in the matter, to save himself a little work. The answer to this is that all training in the use of safeguards of this nature should include the element which leads a man to desire to employ the safeguards for his own sake. It will not do to assume that this point will take care of itself, when it is a daily occurrence, observable by everybody, for an engineer to run into danger which a due regard for his own life and limbs ought to have warned him to keep out of.

The collision at Barnesville was caused by the forgetfulness of an engineer. This man heard that his son was killed in the collision at Black Hand, and was, of course, greatly depressed, but at the next station he learned that the report was unfounded; he was then so overjoyed that he forgot his train order and nearly everything else. The obvious comment on this case is, that the conductor must also have been negligent. It may be that the collision occurred immediately after passing the meeting point, and before the conductor could have opportunity to stop the train. This, however, only affords another forcible illustration of what we have often called attention to; that not only must conductors and engineers be trained to each take upon himself the whole responsibility of a train order, but that conductors, if they are to be of any service in checking errors of this kind on the part of engineers, must be near the front end of their trains, and must be exceedingly alert on approaching meeting points. A newspaper report of a disastrous collision in Wyoming last month states that the conductor discovered the engineer's mistake, and "pulled the air on him," but not until it was too late.

Railroad Capital and Profits.

We commonly hear it said that the railroads of the United States are capitalized at $60,000 per mile. Poor's figures of stock and debt per mile of completed road are $58,000; those of the Interstate Commerce Commission are about $59,000, or, omitting current liabilities, $56,000. The true figure, for all practical purposes, is some $8,000 per mile lower; from $48,000 to $51,000, according to the method of computation. The credit of pointing out this fact is due to the statistician of the Interstate Commerce Commission; but even he has hardly stated the matter with as much emphasis as it deserves.

Of the $8,500,000,000 of railroad stocks and bonds outstanding on June 30, 1889, over $1,100,000,000 were owned by railroad corporations. Prof. Adams speaks of these as forming a *quasi* sinking fund. We should prefer to go a step further, and say that they had no place whatever in the aggregate liabilities of our railroad system as a whole, however important they may be in determining the relations of the several parts of that system to one another. The aggregate liabilities, so far as they take the form of stocks and bonds, are measured by the amounts outstanding, not by those in the treasury of some other corporation. If two roads each had a capital stock of $1,000,000, and one of them issues $600,000 of new stock to exchange for a controlling interest in the other, which it counts as one of its assets in its balance sheet, the resulting liabilities of the combined systems are not $2,600,000, but $2,000,000. From the public standpoint, the $600,000 is neither an asset nor a liability, but a balancing item—a mere form of book-keeping, chosen so as to indicate the relation of different parts of the consolidated system to one another.

Compared with the railroad systems of other countries, $50,000 a mile is a low capitalization. It is only a quarter that of England, two-fifths that of France, or half that of Germany. Those who attack our railroad system because its stock is watered, and urge state railroad ownership instead, will find it hard to point out state systems which are not much worse loaded with liabilities. Whatever water there may be in the capital account of our roads—and in some of them there is a great deal—it is more than offset by the waste incident to government ownership and management.

Take the case of New South Wales, which has been for many years a favorite field of the state socialists. The government has owned the railroads from the very first. Here, if anywhere, there should have been a chance for cheap railroad construction. The country offered no serious natural obstacles. The land was to be had cheap. No special effort was made to avoid grades by cuttings or tunnels. The lines were not constructed for heavy traffic or hard usage. There are practically no fast trains. Only 79 miles out of a total of 2,200 are double track. Yet in spite of all these advantages, the average cost per mile of road in New South Wales is given as £14,000, or $68,000; while the bonds or debentures actually outstanding amount to $63,000 per mile. If the socialist objects to our American railroad capital as "water," what does he say of a government expenditure of 30 per cent. more on lines which ought not to have cost nearly so much?

If it be said in excuse that wages are high in Australia, let us take the case of British India, where they are extremely low. In that country, with its mixed system of government and private ownership, there was, two years ago, a capitalization of £187,000,000 on 14,400 miles of line open. If we assume that some of this capital has been spent for lines not yet in operation, we still have a cost of over $60,000 per mile for roads whose usefulness is by no means up to the American standard. As compared with the systems of other countries, we find that our roads have been efficiently built as well as efficiently managed.

Another point deserves notice. Our railroads pay decidedly more to labor than they do to capital. They pay more in wages than they do in interest and dividends. It is only recently that this has been so. Ten years ago the payments to labor and to capital were not far from equal.

The figures of the census of 1880 are as follows:

Yearly pay rolls		$195,350,000
Interest	$135,480,000	
Dividends	70,550,000	
	$206,030,000	
Less amount paid on stocks and bonds in treasury of companies	27,301,000	
		178,729,000
Add undivided profits for year		48,794,000
		$227,523,000

The latter figure, which represents the amount apparently available for distribution to capital in 1880, is undoubtedly too high to represent real profits, while the sum actually paid to stock and bondholders is somewhat too low. The real earnings of labor and capital cannot have varied greatly from one another in that year.

In 1889, as shown by the statistician of the Interstate Commerce Commission, the figures were as follows:

Interest	$219,568,000	
Dividends	82,110,000	
	$302,078,000	
Less amounts paid on stocks and bonds held in treasury	19,884,000	
		$282,194,000
Add undivided profits for year		19,279,000
		$301,473,000

The aggregate pay roll is not given by the advance sheets of the Interstate Commerce statistics; but as the number of employés has increased from 418,000 in 1880 to 703,000 in 1889, the aggregate figure cannot well be less than $320,000,000, and may probably reach $330,000,000. While the number of employés has increased two-thirds, the actual amount divided has increased only a little over one-half, and the apparent profits only one-third. A mile of line, on an average, employs about the same number of men as in 1880, and each man accomplishes nearly thirty per cent. more in the way of passenger and freight movement than he did before; yet, in spite of this, the investor gets 10 per cent. less per mile of line in 1889 than he did in 1880. This is a most striking illustration and confirmation of Mr. Atkinson's principle that the benefit of modern improvements goes to the community as a whole rather than to the capitalists as a class.

The New Form of Annual Reports.

The form of annual report to the Interstate Commerce Commission for 1890 differs from its predecessors in a large number of minor details. The most important material change is that receivers' certificates are no longer to be included under funded debt, but under current liabilities. The question as to the market price of the stock has also been omitted; a desirable change, since this was not a thing which railroad officials, as such, had anything to do with, or on which they could give anything more than a guess. Under the head of interest, the new form calls for statements of amount *matured* during year, instead of amount paid during year. This is also an improvement, since the result in the new form is easier to get and more important for statistical purposes. "Rental of tracks, yards and terminals" has been put under earnings and operating expenses, instead of being treated as miscellaneous income or deductions from income. Theoretically, the old way was more nearly correct; but we imagine that there were reasons of practical convenience which warranted the change.

The purely formal alterations are much more numerous than the material ones. Both in "Cost of Road and Equipment" and in the General Balance Sheet, the transactions for the year are placed side by side with the general summary instead of being treated in separate tables; so that the reader sees at once statements of property or liabilities at two successive dates, with the changes that have occurred in the interim. In the account of road and equipment this is a mere matter of convenience to the reader; in the case of the general balance sheet it will also render it somewhat less troublesome to make out the returns. Some of our roads will be saved perplexity by the insertion of a new column for betterments paid out of income but not charged to operating expenses. This practice has been so frequent, and the roads which adopted it have

borne so high a character, that the Commission could not help recognizing its existence. In some respects we are sorry that they felt forced to do so, for it is a method of accounting which is readily open to abuse. As a rule, an expenditure on road or equipment is either a renewal, in which case it should be charged to operating expenses, or else an actual addition to the property, in which case, if paid for out of income, it should be represented by an increase of surplus in the general balance sheet.

By no means the least of the improvements is the printing of instructions, in plain type, in just the place where they are needed—that is, right opposite the particular table to which they apply. If they are sent in a separate book, as was done at first, the man who most needs them does not generally find them at all. The form of report now contains pretty much everything necessary for its own explanation except the classification of operating expenses. For that we shall probably always have to have a separate pamphlet, for fear somebody will call a hammer a "supply" and a nail a "repair; whereas, to the truly statistical mind, a hammer is a "repair" and a nail a "supply."

We are glad to see that the use of the national form by state commissions is becoming more general. Eighteen states now use blanks prepared under the direction of the Interstate Commerce Commission, so that the returns to one can be practically copied for another. Seven more conform their requirements to the same practice, though without using absolutely similar forms, leaving only four states with commissions whose requirements are materially different. Two of these—Maine and New Hampshire—are so far from the centre of traffic movement that comparatively few large interstate systems are affected thereby. In the two other cases—Michigan and Missouri—there seems to be more occasion for trouble, especially in Missouri, where there has been a direct refusal to change the fiscal year which forms the basis of state returns to the one which conforms to the practice of the Interstate Commission and the adjoining states. Yet the action of a single state is a small matter compared with the diversity which existed a few years ago, when the same railroad company might have to make out statistics in three or four different forms, at as many different dates, to suit the requirements of the states through which it passed. We may well congratulate ourselves, and the authorities at Washington, that so much has been accomplished in so short a time.

Annual Reports.

Northern Pacific.—The report for the year ending June 30, 1890, is on an average mileage operated of 3,585 miles. The increase in the year was 310 miles, and the total at the end of the year was 3,775 miles. The results of operation were as follows:

Gross Earnings.

Freight	$15,600,319.72	
Passengers	6,167,701.60	
Mail, express and miscellaneous	842,481.46	
Total		$22,610,502.78

Operating Expenses.

Maintenance of road and structures	$3,568,371.49	
Maintenance of equipment	1,978,583.67	
Conducting transportation	6,133,899.39	
General expenses	1,408,282.33	
Total, exclusive of taxes		$13,089,136.88
Net earnings		$9,521,365.90
Percentage of operating expenses, exclusive of taxes		57.89 per cent.
Average gross earnings per mile		$6,272.00
And for the preceding year		5,687.31
An increase of		$584.69

Some of the changes from the year before were:

		Increase.
Freight earnings	$15,600,320	$2 722,482
Commercial freight	15,045,564	2,256,257
Company freight (construction material)	554,756	466,225
Passenger earnings	6,167,702	343,538

The through passenger earnings decreased two per cent., from shorter journeys, and the local increased 9.3 per cent. The increase in local business is attributed mostly to the growth of the country.

The local freight increased 14.5 per cent. in gross revenue and 20 per cent. in tonnage; the through increased 40 per cent. in revenue, but only very slightly in tonnage. The rates on this class were slightly higher and the haul longer. The average haul was 307 miles in 1890 and 304 in 1889 on all freight, and the revenue per *ton mile* was 1.4 cents in 1890 and 1.429 in 1889. The earnings per freight *train mile* were 81.6 cents in 1890 and 77.1 cents in 1889. The local freight yielded 75.7 per cent. of the total freight earnings.

The statements regarding the development of various local interests are important. For instance, the coke carried was mostly from local ovens in Montana, and while it yielded a small part relatively of the freight earnings, it is an important factor in the growth of the country served. So of mining salt, an important commodity in the treatment of silver ores. Heretofore this has all gone from the east. This year 55 per cent. was from Utah points.

The net addition to the construction account for the year amounted to $14,117,760, bringing the total cost of road up to $165,978,800. The net addition to equipment was $1,883,905, bringing that item up to $14,505,490. A large expenditure was made on bridge work and the like; 8,798 ft. of short wooden spans and arch culverts were filled; 2,420 ft. of truss bridges were replaced and 23,370 ft. of pile and trestle bridges were renewed, at an aggregate cost of $236,000. It is the purpose to replace all wooden structures by stone, iron or earth.

The profits on the Wisconsin Central fell short of the guarantee by $144,630. The results of operation of this line were:

Gross earnings	$4,780,345
Operating expenses (exclusive of taxes)	2,970,157

The ratio of operating expenses was 62.13. The freight earnings were $3,437,206, an increase of $794,496. The passenger earnings also increased. The freight tonnage of the Wisconsin Central increased 33 per cent., in which the iron ore business was a very important element.

In our issue of Sept. 19 was published the request of the Master Car Builders' Association's Committee on Standard Couplers that manufacturers of couplers should send to that committee sample couplers with drawings or blue prints. All such couplers and drawings received will be returned upon the completion of the Committee's work. We are informed that but a few samples have been received, and the Committee wishes that attention should again be called to the matter. The object of the Committee is to ascertain if the various M. C. B. couplers now being made and sold conform to the standards of the association. This is a matter of considerably more importance to the coupler men themselves than to the railroads, and we are surprised that prompter and fuller response should not be made to the request of the Committee. A railroad purchasing can easily ascertain whether or not the coupler conforms to the standards. Makers of couplers, perhaps, could ascertain this fact with equal readiness, but a good many of them do not seem to have taken the trouble to do so. It is for their interest that defects of this nature in their own couplers should be made known to them promptly, in order that they may remedy them before it becomes a serious financial matter to do so. The chairman of the Committee, to whom couplers and drawings should be sent, is Mr. E. Chamberlain, New York Central & Hudson River Railroad, Buffalo, N. Y.

The strike reported on the Illinois Central a week ago appears to have been still more foolish than the former one which blocked the traffic of the road several days. We are glad to see that the company has taken summary action, as indicated by the following statement of Superintendent Sullivan in a Chicago paper:

This action of the freight trainmen upon the Chicago division in repudiating the agreement of their committee was the culmination of a spirit of insubordination, defiance of discipline, and of a series of acts of a more or less lawless character extending through a long period. As it was evident there were men in this branch of the service who had lost all sense of duty, recognized no restraint, were not amenable to discipline, had no conception of moral responsibility, and furthermore were insolent to the officials and disloyal to the company, it became necessary to effect a reform by removing from the service the disaffected and insubordinate. To this end 13 conductors and two brakemen, from an organization of 51 freight conductors and nearly 100 brakemen, were the next day discharged. Younger conductors and experienced brakemen were promoted to the positions made vacant.

It will be remembered that the Western Society of Civil Engineers last summer issued to the Engineering Societies of the country an invitation to meet by delegates at Chicago, to take steps to arrange for an international engineering congress to be held during the World's Fair. This convention met this week, representatives of the various societies being present. It was proposed to have a joint headquarters for engineers within the fair buildings for six months, to be maintained and managed jointly by the societies; also to have an international congress for six days. At our last advices these matters were still under consideration. A committee has been appointed to notify foreign societies of the action taken and to invite co-operation.

NEW PUBLICATIONS.

The Railroad Engineer's Field Book and Explorer's Guide; especially adapted to the use of Railroad Engineers in Location and Construction, and to the needs of the Explorer in making Exploratory Surveys. By H. C. Godwin. New York: John Wiley & Sons. Price $2.50.

This is a very handy volume, 6¾ × 4¼ in., and ¾ in. thick, bound in flexible morocco, with flap. It contains 358 pages, all printed in clear type, with 100 figures and 20 tables. The book is divided into four parts:

I. Dealing with Railroad Location, 108 pages; II. Dealing with Railroad Construction, 48 pages; III. Dealing with Reconnaissance and Exploratory Surveys, 72 pages; IV. Giving various General Information 17 pages; followed by 107 pages of tables.

Mr. Godwin's book is unique in the character of its contents in parts I. and III. In the first 33 pages is condensed and presented with great clearness and simplicity about all the information concerning Train Resistances, Propelling Force, Velocity Equivalents, Rise and Fall, Ruling Grades, Pusher Grades, Cost of Operation, Receipts, and Cost of Construction necessary to enable the intelligent engineer to solve all the ordinary problems of location, so far as they are functions of these considerations.

The 60 pages devoted to the Survey cover all the ordinary problems, and are quite sufficient for a field pocket book. The 48 pages given to Construction are exceptionally practical and clear. The author has made an evident mistake, however, in saying that the method of mean end areas gives the same results at that by warped upper surfaces with the prismoidal formula.

Part III., on Exploratory Surveys, treats of the sextant, chronometers, barometers, surveys by triangulation, by direct measurement and compass courses, and by astronomical observations; of the figure of the earth and the computation of geodetic positions. This portion of the book cannot be duplicated in any other handbook in the English language, and is very valuable in carrying on a survey in new or unexplored country, over long distances, with no maps of the region available.

Part IV. is short, covering only 17 pages, and might have been nearly all omitted without detriment. It treats of various matters, such as horse power of streams; strength of timber, and notes on felling, seasoning and preserving it; qualities of iron and mortar; formulæ in plane and spherical trigonometry, etc. The matter given on iron, steel and mortar is weak and more or less misleading. Perhaps all of this part of the book, except the trigonometrical formulæ, might better have been omitted.

The tables are about the same as those found in the ordinary railroad pocket-book, except that only the natural functions are given, these all to the fifth place of decimals. Logarithms are eschewed except a two-page table of logarithms of numbers from 1 to 1,000 to five places. It is the author's belief that logarithmic tables belong on the computing table and in the tent rather than in the pocket, and that a separate set of tables should belong to the outfit, but that they should be omitted from the pocket-book, which alone is carried in the field. They cost more than they are worth when appended to the field book. The author is probably quite right in this particular, and the diminished size of his book seems to justify the omission.

In conclusion, there would seem to be a place for this book, and probably no railroad engineer would ever regret its purchase. It is evidently written by a practical railroad builder, who is a conscientious worker and an inspiring writer. It may be used with advantage in the engineering schools, in some of which it has already been adopted as the standard text book. The author, as well as the profession, is to be congratulated on his having condensed so much valuable matter into so small a space. We heartily commend it to the engineering profession as worthy of their attention and confidence.

TRADE CATALOGUES.

The Leeds Forge Co., Limited, of Leeds, England, has issued a Catalogue F, 1890, of its pressed steel work. It is a very pretty pamphlet of 23 pages, printed in brown ink, and contains 18 pages of illustrations of various designs of pressed steel trucks, car bodies and end frames, as well as locomotive details. This pamphlet will be found instructive to those who are interested in this class of work.

The International Meeting of Iron and Steel Men.

The members of the British Iron and Steel Institute and the Deutscher Verein Eisenhüttenleute, with the Americans accompanying the party, began to arrive in Pittsburgh Tuesday evening, and all got there Wednesday. They were taken in charge by the local committee, but considerable complaint was made at first of insufficient hotel accommodation.

The first session was held at Carnegie Hall Thursday morning. It was opened with the usual complimentary speeches, to which Sir James Kitson replied at considerable length. A paper was presented by Sir Nathaniel Barnaby on the Protection of Iron and Steel Ships against Foundering from Injury to their Shells, Including the Use of Armor. Sir Lowthian Bell read a paper on the Probable Future of the Manufacture of Iron, and a paper on the Development of Marine Engineering in the Past Fifteen Years, by Mr. A. E. Seton, was also read.

In the afternoon parties visited the Wildwood oil fields, the works of the Westinghouse Air Brake Co. at Wilmerding, and other local works. Another session was held Friday morning. Herr Thielen, President of the German society, called the meeting to order with a brief address, to which Dr. R. W. Raymond replied. A paper by T. Sterry Hunt was read on the Iron Ores of the United States. This was followed by a paper by Dr. H. Wedding, of Berlin, on the Progress of German Practice in the Metallurgy of Iron and Steel since 1876. In the course of this paper samples of the Mannesmann seamless tubes were exhibited. This was briefly discussed. It was followed by a paper by Dr. Thielen on the Darby Process of Recarburization. This was followed by Prof. J. W. Langley on International Standards for Analysis of Iron and Steel. Several other papers were read by title. This session closed the official proceedings of the convention at Pittsburgh. A reception was given at the Duquesne Club, and visits were made to the Edgar Thomson and the Homestead Works, and a musical entertainment was given at Carnegie Hall. During the stay of the party at Pittsburgh the Crescent Steel Works were visited, the Keystone Bridge Works, the Lucy Furnace, the Pittsburgh Reduction Works and

many others of the most interesting industries of Pittsburgh. Saturday morning a visit was made to the Connellsville coke ovens. Sunday was spent in Pittsburgh, and the three trains bearing the party left for Chicago at 6 o'clock Sunday evening. Monday morning they arrived at Chicago, where they were received by the Mayor, various city officials and the local committees. Visits were made to Pullman, to the works of the Illinois Steel Co., and to the Fowler Car Wheel Works, and many of the guests attended the Strauss concert at the Auditorium in the evening. A reception was given at the Auditorium.

New England Notes.

II.

The newspapers of Boston and other cities occasionally demand five-hour trains between New York and Boston, and it was even proposed, a year or two ago, that the Massachusetts Legislature consider the question of compelling the roads to increase the speed of some of the trains; but it is quite apparent that the most pressing present duty of the roads is the improvement of the motive power so as to make the time that they pretend to make under present schedules. The writer noticed that two of the trains which should make the trip in six and a half hours had considerable difficulty in making their running time, and every minute lost remained lost. One of these trains (on the Shore Line) that stopped 19 minutes for a hot box was 23 minutes late after it had traveled 60 miles further, although there had been no unusual stoppages, and the engineer apparently worked his engine to its utmost capacity. It is true that the train was composed of 10 cars and that the average on these trains is probably not more than seven or eight; but clearly it is due the passengers to allow a little more margin for unforeseen delays. A traveler needs to be not only experienced but exceedingly wide awake if he must do his own preliminary calculating concerning the possibility of a train making poorer time at the end of the summer season, when travel is a little heavier than usual, than in ordinary times. The New York, Providence & Boston has some very large engines and makes time in spite of an extra car or two. The Shore Line is not perhaps to be condemned for using a lighter engine for regular service on a run of this kind, but when it is clearly apparent that the light engine is adequate to the service only nine-tenths of the time it is no more than fair to provide a helping engine for the other tenth.

The Shore Line engineer who had on his engine the "staff" as his authority to use the track was apparently much interested in it as a novelty, but decidedly disgusted with it as a practical scheme for running trains. Having worked under the ordinary American train dispatching system for many years without mishap, he naturally was averse to the introduction of anything calculated merely to insure additional safety, and which could be availed of only by the sacrifice of more or less time. This man kept the staff lying on the footboard (near his feet, as he sat on the seat), a practice under which it would not be a violent improbability to find an engineer sometime forgetting whether he had the staff on the engine with him or not. It appears that trains are generally slackened to 10 and even eight miles an hour at the point where the staff has to be taken on or dropped off. The 25-mile section of the Shore Line division, which has been lately made double track, rides very smoothly. The ballast is gravel, much of it not remarkably good, bordering on sand.

The criticisms on the Boston & Albany practice in signaling, given in a preceding paragraph, are not the only points of the kind to be seen between New York and Boston. At one place the writer noticed a green semaphore, located in such a position that it had for a background a green tree of precisely the same shade as the semaphore. It would be hard to find a better situation in which *not* to put a signal. Automatic electric signals were noticed on more than one road which failed to go to danger when the train passed them. It may be that those signals were temporarily out of service, but even in such case there would seem to be a lack of proper discipline. If they were ostensibly in service the trains should have been protected by flags, while if the signals were out of service they should have been covered so as to make it clear to engineers, without any necessity for making calculations or referring to orders, that the signals were not to be recognized. One of these signals turned to danger after the engine had passed it about 500 ft., a condition of things which would seem to be equally unsatisfactory whether this action resulted from defective working of the apparatus, or from such a questionable arrangement as that in which the signal is not expected to go to danger until the train has gone some distance beyond it.

The Hall automatic block signals are now quite numerous on the Hartford Division of the New York, New Haven & Hartford, and more are being put in, apparently with the intention of equipping long stretches of road with continuous blocks. The erection of both Hall and Union electric signals on the Boston & Albany is going on at several points, and the equipment of the 98 miles between Boston and Springfield is intended to be completed the present year.

The Boston & Albany, which has within the last two years straightened its line considerably between Boston and South Framingham, has, in connection with this work, prepared a roadbed wide enough for four tracks. Several overhead bridges have been changed in accordance with this plan, and there is altogether a considerable length of the line thus prepared, although it does not appear that the company intends to extend its third and fourth tracks west of Riverside for several years yet. There are few or no streams requiring bridges of considerable length between Boston and Worcester, and the work of building additional tracks will therefore be comparatively easy, so far as the roadway is concerned; but the company's policy of rapidly abolishing grade crossings, which would be badly hampered if a large amount of new work were done on the present grades, doubtless makes the four-tracking plan an expensive one. As railroads are generally operated, this division of the Boston & Albany already has a traffic large enough to require four tracks for probably half its length, but by using a block system, with short blocks, and confining the freight traffic more largely to the night time, the present tracks could be made to answer for some time yet. The high cost of yard room at the eastern termini would, however, be an obstacle to the concentration of the freight traffic into a few hours of the day.

The city of Boston is now supplied with a quite passable substitute for "rapid transit." The street cars running to the suburbs on the north and west, which are propelled by the overhead electric system, run at such good speed that there can be little question that the problem of providing an elevated railroad or increasing the facilities of the service by steam roads will be postponed an appreciable length of time. A number of avenues through which these electric cars run are of liberal width, and the cars can for long distances run as fast as the character of the vehicles and the condition of the track will permit. On the line to Cambridge and Arlington the company has already adopted a time-table under which irregular stops are omitted and much time thus saved; but even with this the stops are really very frequent. The trains (of two cars each) no more than regain their speed before the power has to be shut off for the next stop. To one unfamiliar with the cobweb of wires stretching across the streets, overhead, the need of a workable conduit system or of a practicable and cheap storage battery, by which cars can be run without the aid of anything outside themselves except the track, appeals with special force. It is not necessary to assume that every city will, like New York, permit the wires to be neglected so that after a few years they will fall and kill people; the æsthetic aspect is important. It is particularly painful to see so rude an appliance within the classic precincts of Harvard University.

TECHNICAL.

Manufacturing and Business.

The National Wheel Co. was formed at Jackson, Mich., Oct. 13, with $50,000 capital stock, $35,000 being paid in, to manufacture car wheels. The company will at once build a shop 60 × 200 ft.

The creosote works at Fernandina, Fla., are busy with a large order for the Savannah, Florida & Western road. They have also an order from the King Iron Bridge Co. The timber has been ordered and will be at the works in a few days.

Adams & Price's machine and locomotive works in Nashville, Tenn., were almost destroyed by fire Oct. 10. The large brick building was greatly damaged, and most of the machinery badly injured. The works were just west of the city and had no fire protection. The damage is estimated at $15,000.

The Charleston, Cincinnati & Chicago has given an order to the Beals Steam Brake Co. to equip 11 engines with the steam brake.

Ten new ventilated fruit cars for the East Tennessee, Virginia & Georgia have just been completed by Blaine Bros., of Green Cove Springs, Fla.

A meeting of the creditors of the Harrisburg Car Co. was held at the company's office Oct. 15. Creditors representing 90 per cent. of the indebtedness were present. A statement was read showing that the liabilities do not exceed $595,000, and that the assets are over $1,400,000. The creditors were willing to allow the company every opportunity to recover from its present embarrassment. If necessary, an extension of time from two to three years will be granted. The following committee was appointed to examine the statement made and to cooperate with the company in the interests of creditors during the proposed extension: John Wister, Duncannon, Pa.; George M. Reed, Lancaster; W. W. Card, Pittsburgh; Gilbert M. McCaulley and Spencer C. Gilbert, of Harrisburg.

The Indianapolis Car & Mfg. Co., employing 800 men, was placed in the hands of a receiver last week. Matthew Henning is the receiver. John Voorhees, Purchasing Agent, made the application for the appointment. He says he holds the company's promissory note for $2,000 and that it is insolvent, having debts amounting to $650,000 and assets of but $600,000. Col. Charles Millard, President of the company, thinks the receiver will be able to continue the business and in time turn it over to the stockholders clear of indebtedness.

The Slatington Rolling Mill, which commenced operations this month, is now shipping large quantities of muck bars. Messrs. Anthony & McElroy, 328 Chestnut street, Philadelphia, are sole agents, and have orders ahead sufficient to keep the mill at full capacity for a considerable period.

The Fox Solid Pressed Steel Co., whose works are at Joliet, Ill., have passed into the entire control of Samson Fox, of England, under whose patents the company was operating. The works have hitherto been largely owned by the Illinois Steel Co. It is the intention to greatly enlarge the capacity of the plant and to extend its operations in new directions. Additional machinery has been ordered. The works manufacture car-truck frames, locomotive boiler extensions and a large line of railroad specialties.

Iron and Steel.

The annual meeting of the Reading Iron Co. was held last week. The old officers were re-elected as follows: President, George F. Baer, Reading; Secretary, Thos. O. Yarington, Reading; Treasurer and General Manager, Frank C. Smink, Reading; Directors, Geo. F. Baer, Reading; A. A. McLeod, Philadelphia; E. C. Henderson, Pottsville, and Simon Seyfert and Geo. Clymer, Reading. The company, since its reorganization, has been doing a very satisfactory business. Its furnaces, mills and foundries are all in full operation, employing several thousand hands.

The Moore Structural Iron Works, with a capital stock of $150,000, has been organized at Grand Rivers, Ky.

The Cardiff Rolling Mill Co., with a capital stock of $200,000, has been organized at Cardiff, Tenn., to build a sheet iron and steel mill. A building 125 × 250 ft. will be erected to contain 12 puddling furnaces and one heating furnace. Another building of similar size will contain three trains of sheet rolls, with annealing and heating furnaces. The incorporators are M. M. Duncan, H. C. Young, C. T. Moore and others.

The Roane Iron Co., at Rockwood, Tenn., are preparing plans for the erection of a rolling mill.

The Pittsburgh Malleable Iron Co., of Pittsburgh, has been granted a charter, with a capital stock of $25,000. The directors are: Frank Moore, J. R. McGinley, George Rollings, T. W. Seiman and T. B. Atterbury, Jr., all of Pittsburgh.

Work is being pushed rapidly on the new foundry now being erected by the Totten & Hogg Iron & Steel Foundry Co., at Pittsburgh. It is to take the place of the one recently destroyed by fire, and will be considerably larger than the old one.

At a recent meeting of the stockholders of the Ætna Iron & Steel Co., of Bridgeport, O., it was voted to increase the capital stock from $302,000 to $500,000. A stock dividend of $198,000 was declared out of the surplus of the company. The increase in stock is about 65 per cent., and there still remains about $100,000 in the surplus fund. The stockholders were notified that the deal with the English syndicate, at one time thought to be near consummation, was entirely off, and the plant will continue to be operated by its present owners.

The Rail Market.

Steel Rails.—Few orders have been placed with any of the mills, and almost the only inquiries are for next year's delivery. The quotations for this year are: At New York, $30; at Pittsburgh, $30@$31; at works and at Chicago, $32@$32.50.

Old Rails.—A lot of 300 tons of foreign tees were sold at Philadelphia for $26. This is the only business in the East. At Pittsburgh the quotation is $27.75@$28 for old iron rails, and at Chicago, $26.75@$27.25.

The Vestibule Patents.

Judge Colt, in the United States Circuit Court at Boston, Oct. 9, decided the case of the Pullman Palace Car Company against the Boston & Albany, for infringement of the patent on vestibule cars, in favor of the plaintiff, giving the Pullman Company a complete victory. It will be remembered that the Wagner Palace Car Company is the virtual defendant in the case, a suit concerning details of the vestibule having been contested in the courts last year. The opinion by Judge Colt declares Mr. Pullman the inventor of the vestibules, that the invention was patented and that the patent is infringed in four respects, as follows: 'In defendant's car there is a face-plate and a buffer-plate, both being connected with a spring-extended buffer-rod, and both having the restraint of motion set forth in the patent, and it is, therefore, within the first claim of the patent. It has also the threshold, or foot-plate, combined with the arch-plate and buffer-plate, so as to have the motion and be restrained in the same manner, and it is therefore within the second claim of the patent. It has also the bellows-like connection when combined with the other elements, so as to produce the same results, and is within the fourth claim. It has a vestibule provided with doors at the sides, in addition to the other elements contained in the fifth claim of the patent, and it therefore infringes that claim.

The decision rendered by Judge Gresham last year involved mainly the patent on the springs and equalizing lever for pressing the face-plates together, the means of bringing those plates into contact, the novelty of the idea of extending the buffer (face-plate) from the bottom to the top of the car so as to resist collision, and the claim of the patent on the utility of the face-plates to prevent oscillation. That suit was argued mainly on the facts as related to a train coupled together; the suit now decided has hinged more specifically on the novelty of parts whose characteristics and functions could be considered in a single car by itself.

Much of the contention in the present case was concerning the relative shares of Pullman and Sessions in the patents controlling these parts. Mr. Sessions, who is General Manager of the Pullman Company, applied for a patent on a frame and a face-plate backed by buffers and springs, his purpose being to provide for the slack and oscillation in starting, stopping and running on curves; his application was presented just before Pullman's, and the drawings with it also showed some of the features which Pullman invented and two weeks afterward asked to have patented. Pullman's application in this case related chiefly to the "accordion" connection, to provide flexibility. The defendant claimed that the presence of Pullman's features in the drawings accompanying Sessions's earlier application invalidated the claim of novelty. Judge Colt "has no doubt that the structure used by the defendant is within the patent," the only important difference being that the defendant hinges the arch plate to the buffer plate. "This construction may not work perfectly, but it contains the substance of the Pullman invention as set out in claims 1, 2, 4 and 5 of his patents." The decree stipulates that the patented devices now used on 205 Wagner cars shall be taken off within 40 days.

The Bids for the New War Ships.

Bids were opened at the Navy Department, Oct. 1, for building three armored battle ships of 9,000 tons displacement, and one protected cruiser of 7,500 tons displacement. The first bid was that of the Union Iron Works, of San Francisco, for one battle ship on the department's plan for $3,420,000, or two for $3,200,000 each, a total of $6,400,000. Cramp & Son, of Philadelphia, bid $2,990,000 for one battle ship on the department plan, or $3,120,000 on their own plan, and for two on the department plan at $2,890,000 each. They also bid $3,020,000 each for the ships on their own plans. The Bath Iron Co. made one bid, that for the battle ship on the department plan, for $3,149,000. The Risdon Iron Works, of

San Francisco, also bid for the battle ship on the department's plan, their proposal being $3,275,000. The next bid was for protected cruiser No. 12. The Union Iron Works bid $3,025,000, and Cramp & Son $2,725,000, both on the department plans. The Cramps will probably be awarded two of the battle ships and the cruiser on their plans, and the Risdon Iron Works one of the battle ships on the plans of the Cramps for $60,000 more than was bid by that firm.

Master Car-Builders' Association.

RESULTS OF LETTER BALLOT VOTES.

A summary of the votes cast on each of the questions submitted is given below, together with the results of the ballot.

Summary of Votes and Results.

Subjects Voted on.	Question.	Number Votes Cast. Affirmative.	Negative.	Total.	No. votes necessary for adoption	Results of Votes.
Journal box for cars of 60,000 lbs. capacity	a	299	249	548	366	Rejected.
Lid for 40,000 lbs. capacity journal box	b	297	251	548	366	"
Loading logs and poles on cars	c	539	1	540	330	Adopted.
Racking cars for loading bark	d	467	53	520	347	"
Height drawbar passenger equipment cars, 35 in.	e	539	8	547	365	"
Safety chains for passenger equipment cars	f	440	108	548	366	"
Brake beam lever, lateral angle 40 degrees	g	502	41	543	362	"
Fitting for train pipe for steam heat 2-in. female, standard pipe thread	h	390	146	536	358	"

JOHN W. CLOUD, Secretary.

CHICAGO, Ill., Oct. 7, 1890.

The Lake Built Coaster.

This steamer, the "Mackinaw," built by Wheeler at West Bay City, is now at Buffalo, in the Union Dry Dock, being cut in two so as to enable her to pass through the locks in the Canadian canals. She is 290 ft. over all, with 41 ft. beam, and on 22 ft. draft will carry 4,000 tons. This is the first of four steamers that are to be run in the Atlantic coasting trade by the Saginaw Steel Steamship Company, and Mr. Jerome, of Saginaw, will come to New York as manager of the line. Three Clyde-built steamers for the Canadian Pacific were cut in two at Quebec to get them through the Canadian canals, but the "Mackinaw" is the first vessel so bisected that was built on the lakes.

Cornell University—Engineering Departments.

The facilities and capacity of the department of mechanical and electrical engineering have been greatly increased. This became necessary because of the increase in number of students, which now is about 500. An entire new set of workshops has been provided, also a new chemical building capable of accommodating 1,000 students. A large dynamo testing room has been fitted up for the electrical department and is placed in charge of Prof. Moler and Mr. Geo. Shepardson, R. G. '89. The capacity of the mechanical laboratories has been increased, a new engine room, containing six large high-speed engines, having been added. This department is now in charge of Prof. Carpenter, formerly of the University of Michigan.

A Government Contract Awarded.

The Navy Department of the United States has just awarded the contract to furnish the wood-working machinery required in the navy yard at Norfolk, Va., to the Egan Company of Cincinnati, O. Among the machines ordered is a complete outfit of planing, sash, door and blind machines.

New Army Guns.

The Ordnance Department of the United States Army has formulated the instructions to prospective bidders for the construction of twenty-five 8-in., fifty 10-in. and twenty-five 12-in. breech-loading steel guns under the recent appropriation of $3,775,000 made for the purpose. The private contractors are not required to follow the plans of the type guns built by the Ordnance Department. They can submit designs of their own under certain general conditions, or if they choose adopt the army plans. They are required to furnish a gun that will be equal in power and endurance to the gun of the same calibre built by the government. They are to submit type guns of each calibre that must show a muzzle energy of not less than 7,600 ft. tons for 8-in, 15,000 ft. tons for 10-in. and 26,000 ft. tons for 12-in. guns, and show a range for 20 deg. elevation of 11,000 yds. for 8-in. guns, 13,650 yds. for 10-in. guns and 14,700 for 12-in. guns.

The Broadway Cable Road.

Work has already been begun in changing the horse railroad in Broadway, New York, to a cable road. The contractor is Mr. John D. Crimmins, of New York. The cable conduits will be of steel plate with cast iron yokes. A considerable quantity of material has been accumulated in a yard at the foot of West Thirty-eighth street, where the parts will be assembled and fitted and marked and stored, ready to be laid rapidly when the work of excavation permits it. Undoubtedly, very great difficulty will be encountered in this work, as the position and condition of the many pipes under the pavements are practically unknown.

Pintsch Gas in England.

The following is an extract from the minutes of proceedings at the eighty-eighth half-yearly meeting of the proprietors of the Great Northern Railway Company, held at King's Cross Station, London, on Friday, Aug. 8, 1890: "Then, you will observe an item for new gas works at Holloway for lighting carriages. For some years we have been making experiments, and have tried everything, including electricity; but we have now decided to light our carriages with compressed oil gas. The first outlay, including the fittings for the carriages, will be considerable; but in the end, the lesser cost of oil gas in daily working will be a saving." The system of lighting by Pintsch gas, to which the above has reference, has, as most of our readers know, been in use in this country for seven or eight years, and with very satisfactory results. It is in use in Europe on over thirty-six thousand coaches, and is used here on the following railroads, besides the cars of the Pullman and Wagner Sleeping Car Companies: New York, Providence & Boston, Baltimore & Ohio, Canadian Pacific, Central of New Jersey, Rome, Watertown & Ogdensburg, Old Colony, Richmond & Danville, Boston & Albany, Louisville, New Albany & Chicago, Delaware, Lackawanna & Western, Chicago & Atlantic, Philadelphia & Reading, New York Central & Hudson River, East Tennessee, Virginia & Georgia, New York & New England, Rio Grande Western, Denver & Rio Grande, Wabash, Cincinnati, Hamilton & Dayton, Central of Georgia, West Shore, New York, Lake Erie & Western.

THE SCRAP HEAP.

Notes.

The Central New England & Western has adopted the train-staff system for moving trains on certain sections of its road.

The Lake of the Woods Milling Co. has completed five new elevators at Hartney, Souris, Virden, Carberry and Griswold, Manitoba. Each has a capacity for 30,000 bushels.

The Southern Pacific has agreed to refer to arbitration the differences between itself and engineers on the Atlantic system regarding rules of promotion, Chief Arthur having visited San Francisco to secure this agreement.

Detectives at Philadelphia last week arrested a man who had for five months ridden on the Pennsylvania passenger trains for the express purpose of stealing the hand baggage and overcoats of passengers while they were out at lunch at Philadelphia.

A heavy rain storm, producing a serious flood, did a large amount of damage in the vicinity of Parkersburg and Wheeling, W. Va., on Sunday and Monday last. The Baltimore & Ohio suffered severely, two bridges and a large number of trestles being washed away.

John Kiernan, the only one of the five alleged New York Central train wreckers who was indicted by the grand jury, was discharged at West Troy by Justice Grogan, Oct. 11. The motion made by Kiernan's counsel to commit Superintendent Harrington for perjury was denied.

A locomotive engineer of Detroit has a scrap book in which he has pasted 147 stories of engineers' wild rides, thrilling escapes, etc. He says that not one of these stories is true in any particular, but that they were all concocted by men who know nothing about the life of an engineer.—*Exchange.*

The officers of the Federation of Railroad Employés went to Houston, Tex., last week to investigate the strike of switchmen who left work because the Houston & Texas Central employed negroes in that work. They secured the reinstatement of the strikers, but concluded not to press their grievance.

The reports of the Brotherhood of Locomotive Firemen presented at the recent annual meeting show that the organization borrowed $26,000 from the Brotherhood of Locomotive Engineers to help pay strikers during the Burlington strike. The loan has not been paid, and there seems to be some question whether either side desires to have it paid.

An overhead bridge of the Pennsylvania road near Reading, Pa., fell upon the tracks on the night of Oct. 3, the supports having been weakened by heavy rains. Near Webster Springs, W. Va., Oct. 11, an unfinished highway bridge gave way while six persons on horseback were crossing it. The men, women and horses were precipitated 40 ft. into the Elk River and two of them were fatally injured.

The New York, New Haven & Hartford has again been ordered to pay penalties amounting to $7,000 for violating Chapter 189, Laws of New York, 1888, concerning the heating of passenger cars on steam surface railroads. The Court of Appeals at Albany has affirmed an interlocutory judgment entered upon the decision of the lower court made in an order granted June 5, 1889, overruling the demurrer to the complaint interposed by the defendant. The railroad company contended that it was placed on an equal footing with railroads of 50 miles and under in length constructed entirely within this state. The law exempts these short roads from complying with the act of 1888. The length of road of the New York, New Haven & Hartford in New York state is less than 50 miles.

Foreign Notes.

New regulations have just been issued for the heating of passenger cars on the Prussian government railroads. They specify that from Oct. 1 until the end of November, and from March 1 until the end of April, passenger cars for both day and night service must be heated whenever the outside temperature falls below 5 degrees R. (43¼ degrees F.). From Dec. 1 until the end of February the cars must be heated continuously without regard to external temperature. In general the cars are to be kept at an average temperature of 50 degrees F. This, or a close approach to it, must also be secured in the cars before they are sent out in a train. After the heating period has commenced the heating must be continued until there have been three successive days on which the outside temperature, during the night, has not fallen below 43 degrees.

To Open the St. Clair Tunnel.

The St. Clair Tunnel Celebration Committee have agreed upon the outlines of a programme for the occasion. It has been decided to hold the grand banquet in the tunnel itself. The table is to be 1,000 ft. long, and located so as to be 500 ft. on each side of the International boundary. The chairman is to be seated exactly on the line. On the Canadian side of him will be the President of the United States and on the American side will be the Governor-General of Canada. The tunnel will be brilliantly lighted by electricity, and the decorations will be very handsome. The expenses of the great demonstration are to be defrayed entirely by private subscription, and the corporations of Sarnia and Port Huron will not be called upon.

The German Cement Trade.

Three cement factories at Stettin, employing on an average 1,610 men per day, turned out last year 644,000 barrels of cement of 380 lbs. each. The men were paid 2 m. 50 pf., or 62 cents per day. The dividends paid varied from 27 to 7 per cent. Besides what cement was sold in Germany shipments were made to this country, Denmark, England and Australia.

A Valuable Consul.

Owing to the influence of the German Consul at Bangkok, Herr Bestige, a German engineer in the employment of the Siamese Government, has been appointed to carry out the construction of a railroad from Bangkok to Kerat. The length of the line will be 105 miles, and the estimated cost is £1,300,000. German rails and machinery will be used in the construction of the line. The subordinate engineers employed will be mostly Germans.

Proposed Reciprocity in Car Wheels.

The Canadian Minister of Customs was waited upon this week by representatives of the National Dispatch and the Canada Atlantic road, asking permission to bring car wheels into Canada free of duty to replace wheels which may be broken on cars in Canada. This concession is not allowed to Canadian railroads in the United States, nor to the manufacturers of car wheels in Canada, and consideration of the matter by the government was thought to be necessary. The Minister suggested that a formal request be made, when action would be taken upon it.

A Per Diem Charge for Line Cars Only.

The difficulty in the way of the introduction of the mixed mileage and per diem system, as previously recommended by the committee, appears to be on account of a too radical change from the straight mileage system. As the straight mileage system would involve a still greater change, it must, on this line of reasoning, be left out of consideration. What, then, can be done to give per diem, as an incentive for car movement, a foothold? We would suggest a modification of the plan so that the per diem charge will apply only *on line cars when on roads not members of the line to which the cars are assigned*, making the rate 25 cents per car per day. This will result in keeping the line cars on the roads to which they are assigned and where they properly belong. It will also result in keeping common cars at home, where they properly belong, and in regulating the supply of line and common cars commensurate with the legitimate demands of the service, the line cars to take care of through and the common cars of local business exclusively. The result to be secured gradually. Then place the control of all line cars in the hands of the line manager, or a joint car distributer for all the roads in interest, the car accountant of each individual road to devote his whole time to his own road. The greatest trouble with the present mileage system is, that cars get scattered all over the country and are seldom where most needed. The plan we suggest would correct this and wonderfully simplify the work of distributing and keeping track of the cars. One of the most serious objections raised against the per diem systems thus far advocated has been that no provision has been made for holding cars exempt from per diem charges for lading anticipated or in sight, which fact would either involve unnecessary empty movement, or per diem expense if cars are not moved. The plan we have briefly outlined covers this objection perfectly. It has been suggested before that the per diem charge should apply only to *common* cars, and that the line cars be run entirely on the mileage basis. It was in considering this suggestion and while trying to find a way to overcome the many objections that we hit upon the idea of reversing the conditions and applying the per diem charge exclusively to line cars.—*Equipment Guide.*

Better, even, than a Howe Truss.

"And you mean to say that your train crossed the chasm where the bridge had burned without being wrecked? Remarkable! What kept it from going down?"

"As good luck would have it, just at that moment it was being held up by train robbers."—*Chicago Post.*

Nine Months' Iron Output.

The furnace capacity returns of the *American Manufacturer* on the first of October show that there were 337 furnaces in blast, with an aggregate weekly capacity of 176,783 tons, as against a capacity of 167,233 tons of furnaces in blast on Sept. 1.

This enables us to calculate the production of the first nine months of this year as 6,826,984 gross tons. The production for the first six months was, according to Mr. Swank's figures, 4,615,837 gross tons, or about 35,000 tons less than the furnace capacities show.

Our make of pig iron for the first nine months of the three past years has been as below, in which the production for a half year is as returned by Mr. Swank, and for the three months, July, August and September, as approximately determined by furnace capacities:

Production of Pig Iron, First Nine Months, Gross Tons.

	First half.	Third quarter.	Total.	Total per year.
1888	3,020,092	1,559,934	4,580,026	6,489,738
1889	3,661,603	1,761,906	5 423,509	7,603,612
1890	4,615,837	2,211,147	6,826,984	... .

This gain for the first nine months of 25.8 per cent. over the make of last year is a pleasant showing in the aggregate, though it is not so pleasant as it would be if the production for the third quarter of the year had not been 154,500 tons less than that of the second quarter. But as Congress has now adjourned and the demand for finished iron of all kinds is very active, though the demand for pig iron is sluggish, there seems every reason to expect that we will exceed this predicted make of 9,000,000 gross tons by one or two per cent. This implies a consumption of 320 lbs. per capita, of which probably not more than 23 lbs. will go into new railroad tracks, though the consumption for rolling stock must be very heavy.

Suez Canal Traffic.

During the year 1889 3,425 vessels passed through the Suez Canal. The total freight carried amounted to 6,783,187 tons, showing an increase of 143,000 tons over 1888, and the number of passengers was about 180,000, showing a falling off of 3,300. The gross traffic receipts were 66,313,302 francs, against 65,242,021 francs in 1888, and the net profits for the two years amounted to 37,212,821 and 36,271,247 francs, respectively. The number of ships passing through the canal at night by the aid of electric light steadily increases from year to year. In 1887 there were 395; in 1888, 1,611, and in 1889, 2,445. During the early part of 1890 the number had already risen to 1,800. By traveling at night, as well as during the day, the average duration of the passage through the canal is 22½ hours. The shortest passage yet made consumed 14¾ hours.

The Employers' Liability Assurance Corporation,

This company (71 Kilby street, Boston, Mass.), reports that employers' liability insurance is making progress. The South is offering an enlarging field for this business. The great and rapid increase in the number

of industrial establishments and the increase of capital in that section has been followed by a demand for insurance against liability from accidents to workmen. It is observed that the concern which has no surplus of working capital will rarely insure, though an accident to its employés might entail expenses it could ill sustain, while those with ample funds, able to run their chances, are the ones who desire insurance. The late decision of the United States Circuit Court that vessel owners are liable for injuries to sailors arising from defective condition of the rigging, thus reversing previous rulings, is expected to open a great field for employers' liability insurance among vessel owners. Another branch of this form of insurance which has assumed considerable proportions is elevator insurance. Owners and lessees of buildings may be liable for claims on account of accidents which may happen to a passenger or employé in or around an elevator, and the insurance companies therefore offer to insure up to $5,000 for any single person and to an aggregate of $10,000 in case two or more are injured. While this insurance promises indemnity to the owners of the property from loss by elevator accidents, the general public receives additional protection from the thorough and frequent inspections to which the elevators are subjected.

LOCOMOTIVE BUILDING.

The Baltimore & Ohio is building at its Mt. Clare shops 10 ten-wheel locomotives and six consolidation engines.

The Dickson Manufacturing Co., of Scranton, Pa., has been awarded a contract for building 15 mogul locomotives for the Delaware & Hudson Canal Co.

The Savannah, Florida & Western is in the market for new locomotives.

The Great Northern has issued specifications for about 50 engines. The contracts will not be awarded this year for so large a number, as most of the engines are intended for use on the Pacific coast extension.

The Atchison, Topeka & Santa Fe has placed an order for 50 locomotives with the Brooks Locomotive Works and for 25 with the Schenectady Locomotive Works.

The Atlantic & North Carolina has let eight eight-wheel passenger engines to the Richmond Locomotive Works.

An order has been placed by the Georgia, Carolina & Northern Railroad for 18 coal-burning locomotives.

CAR BUILDING.

The Iron Car Co. has divided its order for 2,400 iron cars with two or three of the car buildings firms. Of this number 1,000 cars have been ordered by the East Tennessee, Virginia & Georgia.

The Swift Refrigerator Co., of Chicago has recently ordered 100 cars to be bui t by the Michigan Car Co.

Armour & Co. were to place an order for 200 refrigerator cars at Chicago this week.

An order for 500 cars has been recently placed by the Florida Central & Peninsular.

The St. Charles Car Co. has recently turned out from its shops some very fine chair cars for the Kansas City, Fort Scott & Memphis.

The Huntingdon & Broad Top road is in the market for 200 cars.

BRIDGE BUILDING.

Aberdeen, Ky.—John Griffith will construct a $2,750 bridge over the Fishing Gut Creek.

Augusta, Ga.—Grant Wilkins, of No. 9 Peachtree street, Atlanta, Ga., engineer for the North Augusta Land Co., of Augusta, Ga., invites bids, until Oct. 20, for the construction of a steel bridge across the Savannah River.

Becket, Mass.—Bids were received this week by the Road Commissioners for an iron bridge having an 18-ft. span and 20-ft. roadway. F. D. Ballou, J. A. Hunt and W. K. Holmes are the commissioners.

Centralia, Wash.—Kilpatrick Bros. & Collins have let the contract work on the Seattle branch of the Union Pacific, north of Centralia, to McKenzie & Glinn, successors to A. McKenzie & Co., who also have the contract for bridge work south of Centralia.

Clinton, Ill.—The Chicago & Eastern Illinois will replace its present wooden bridge at Clinton with a steel structure. Next year the balance of the wooden bridges will be replaced with iron and steel structures.

Dayton, Tenn.—The Tennessee Industrial Land Co., of Dayton, will build two iron bridges over railroads.

Dublin, Ga.—John F. Duncan, of Dublin, invites bids, until Oct. 20, for constructing an iron bridge 320 × 18 ft., across the Oconee River; also for building approaches, 800 × 18 ft., for the bridge.

Edna, Tex.—The Commissioners' Court of Jackson County, in special session, has awarded a contract for an iron bridge at Texana to the Berlin Bridge Co.

Elizabeth, Pa.—The Elizabeth Borough Council has granted an ordinance to the Elizabeth & West Elizabeth Bridge Co., giving the right to construct an approach to a proposed bridge to span the Monongahela River between the points named. The bridge will cost $90,000 and will be completed by July 1, 1891. B. L. Wood and W. B. Wood and W. C. and A. Jutte, of Pittsburgh, are directors.

Florence, Ala.—The new Memphis & Charleston Railroad bridge across the Tennessee River at Florence, Ala., was swung Oct. 10, with satisfactory results. The bridge is of steel and iron and 412 ft. long.

Greenville, S. C.—L. K. Clyde will receive bids for the construction of a bridge over the Saluda River.

Hancock, Md.—The Hancock Bridge Co., of Washington County, has been chartered in Maryland. The object of the corporation is the erecting of the proposed toll bridge across the Potomac at Hancock. The principal office will be at Hancock. The capital stock is $30,000. Edmund P. Cahill, J. F. Fields, Ellery Colby, W. H. Perkins and P. E. Dawson are named as directors.

Montreal, Que.—The promoters of the bridge across the St. Lawrence, from Montreal to Longueuil, will apply at the next session of the Dominion Parliament for leave to make a few changes in the proposed structure. The first plan placed the bridge 170 ft. above the level of the river, and the company desires to change this to 150 ft. They claim that all steamers will be able to pass under should the change be made. It is also proposed to incorporate the bridge scheme with that of the elevated railroad enterprise proposed by R. Prefontaine, M. P., Henry Hogan and others, of Montreal.

Orange Grove, Md.—A bridge to cost about $22,000 will probably be built across the Patapsco River.

Philadelphia.—The Park Commissioners have received plans for a new iron bridge over Lansdowne Ravine. The new structure is to cost $50,000, and will take the place of the present wooden bridge.

Pittsburgh, Pa.—The Erie & Wyoming has just completed a survey for a bridge that the company proposes to erect across the Susquehanna River.

Roanoke, Va.—The city council has rescinded the contract of E. McConnell for the construction of approaches to bridges over streets of that city.

Winona, Minn.—The Winona Railway Bridge Co. was recently organized in the interests of the Chicago, Burlington & Northern, Green Bay, Winona & St. Paul, and the Winona & Southwestern railroads, and is building a steel bridge across the Mississippi River at this place.

It consists of about 1,400 ft. of iron structure and 1,300 ft. of pile approach, the contract for all of which has been awarded to the Union Bridge Co., of Buffalo, N. Y. The piles are driven for the foundations for all the piers except one, and the stonework of two piers has been begun. The draw span is 444 ft. long, the raft span 364 ft. and the other spans 240 ft. each. The bridge is to be finished by March 1. The officers of the bridge company are as follows: President, M. G. Norton, of Winona; Vice-President, Jos. Walker, Jr., of New York City; Treasurer, H. W. Lamberton, of Winona; Consulting Engineer, G. S. Morrison, of Chicago; Chief Engineer, D. M. Wheeler, of Winona, and Resident Engineer, F. K. Pingry.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

East Tennessee, Virginia & Georgia, 5 per cent. on the first preferred stock.

Evansville & Terre Haute, quarterly, 1¼ per cent., payable Oct. 20.

Lake Erie & Western, quarterly, 1 per cent. on the preferred stock, payable Nov. 15.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Alabama Great Southern, annual, adjourned, Birmingham, Ala., Oct. 22.

Alabama & Vicksburg, annual, Jackson, Miss., Nov. 3.

Chesapeake & Ohio, annual, Pace Building, Richmond, Va., Oct. 21.

Cincinnati, New Orleans & Texas Pacific, annual, Cincinnati, O., Oct. 20.

Cincinnati, Sandusky & Cleveland, special, Sandusky, O., Oct. 29.

Cincinnati & Springfield, special, Grand Central Depot, Cincinnati, O., Oct. 29.

Cleveland, Cincinnati, Chicago & St. Louis, annual, Cincinnati, O., Oct. 29.

Columbus, Springfield & Cincinnati, annual, Columbus, O., Oct. 21.

East Tennessee, Virginia & Georgia, annual, Knoxville, Tenn., Nov. 19, and special, Knoxville, Tenn., Dec. 6.

Evansville & Terre Haute, annual, Evansville, Ind., Oct. 20.

Knoxville Belt, special, 126 Gay street, Knoxville, Tenn., Nov. 1.

Knoxville, Cumberland Gap & Louisville, special, 126 Gay street, Knoxville, Tenn., Nov. 1.

Knoxville Southern, special, 126 Gay street, Knoxville, Tenn., Nov. 1.

Louisville, New Albany & Chicago, special, 47 Broadway, New York City, Oct. 29, to consider proposed extensions.

Milwaukee & Northern, special, Milwaukee, Wis., Nov. 12.

Nashville, Chattanooga & St. Louis, special, Nashville, Tenn., Oct. 29.

New Orleans & Northeastern, annual, New Orleans, La., Nov. 5.

Railroad and Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at its rooms in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month in the St. Paul Union Station at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of each month at 7:30 p. m. in the directors' room of the St. Paul Union station, except in the months of July and August.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month. at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1,122 Girard street, Philadelphia.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p.m. on the third Thursday of each month at the Club rooms, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8:00 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the Southwest* holds regular meetings on the second Thursday evening of each month at 8 o'clock, at the Association headquarters, Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7.30 p. m., on the third Saturday in each month.

The Civil Engineers' Association of Kansas holds regular meetings on the first Wednesday in each month at Wichita, Kan.

Engineering Association of the Southwest.

A regular meeting was held at the hall of the Chamber of Commerce, Chattanooga, Tenn, at 8 o'clock p. m., Oct. 10. A paper on the Tennessee River Bridge at Chattanooga, by Mr. James A. Fairleigh, of Chattanooga, was read. The report of the Committee on the "Cause of the Setting of Cement" was also submitted and discussed. On Saturday, Oct. 11, the members of the Association visited Lookout Mountain, the Tennessee River bridge now in course of construction and the new Basic Steel Works.

The New York Railroad Club.

A meeting was held at the Gilsey House, New York City, Thursday afternoon, Oct. 9. It was resolved to proceed at once with the reorganization of the Club. Something over 30 gentlemen who were present signed a new membership roll and paid their dues, thus qualifying as members. A committee was appointed to prepare a revision of the constitution and by-laws to be submitted to the Club at its next stated meeting, the third Thursday in November. A committee on subjects was also appointed, as well as a committee on rooms. A club room has been engaged in the Gilsey House and arrangements have been made to secure in the same house a large meeting room for the regular monthly meetings or other assemblies. A good deal of interest is shown in the reorganization, and it is believed that the Club will at once be put on such a footing as to greatly enlarge its work and its usefulness. As the club room will be open every day and evening, it is hoped that it will be used as a headquarters and place of resort for railroad officers, dealers in railroad supplies and others interested in railroad matters.

The Western Railway Club.

The club will hold its next meeting on Tuesday, Oct. 21, at 2 p. m., in its rooms in the Rookery Building, Chicago. The subjects for discussion are: (1) "Rigid and Swing Beam Trucks and the Comparative Flange Wear of Wheels." This subject will be reported upon by a committee consisting of William Forsythe, C. A. Schroyer and P. H. Peck, which committee made only a partial report at the September meeting. (2) "Steel-Tired Wheels and the Principles to be Followed in Attaching Tire to Centre." Mr. G. W. Rhodes will present a paper upon this subject.

To List New Securities.

An application has been made to the New York Stock Exchange by the Chicago, Milwaukee & St. Paul to have $6,346,000 additional common capital stock placed on the regular list. Of the amount named, $6,158,300 has been issued in exchange, share for share, for the Milwaukee & Northern stock.

The Central Pacific asks to list $4,261,000 land grant five per cent. gold bonds. These are a part of the six per cent. issue which matured Oct. 1, but were then extended at five per cent. to 1900.

PERSONAL.

—Mrs. W. W. Wilson, wife of the former Superintendent of Machinery on the Chicago & Alton, died suddenly at Bloomington, Ill., Oct. 27.

—Mr. W. T. Hefflin, Auditor of the Georgia Southern & Florida road, died suddenly on Oct. 5. He had been appointed to the position in July.

—Col. Michael Brown, General Manager of the Savannah Construction Co., which is building the South Bound road, has resigned that position.

—Mr. H. C. Norton, a nephew of Mr. Austin Corbin, has resigned as Purchasing Agent of the Philadelphia & Reading Coal & Iron Co., with which he had been connected for three years.

—Mr. W. D. Turner, lately Superintendent of the Brown & Sharpe Manufacturing Co., has been appointed General Manager of the Eames Vacuum Brake Co. at Watertown, N. Y.

—Mr. Alexander Sutherland, who had been in the employ of the Camden & Amboy and of the Pennsylvania for 25 years, died suddenly in South Amboy, N. J., Oct. 13. For some time he was Superintendent of the Amboy division of the Pennsylvania, and when he died he was General Freight Agent of the same division.

—Mr. Walton O. Kernochan, Treasurer of the Johnson Railroad Signal Company, committed suicide in New York last Sunday morning at half past five o'clock. Mr. Kernochan was 27 years old, unmarried, and a man of large fortune. His suicide is attributed to hypochondria, as his friends can imagine no other business or personal reason for it.

—Mr. C. F. Dutton, the late General Manager of the Milwaukee & Northern, has assumed the temporary management of the Iron Mountain, Escanaba & Western Railroad, now being constructed by the Schlesinger syndicate, in Northern Michigan. Mr. Dutton has been offered the permanent management of the road, but has not yet decided to accept it.

—Mr. Y. Foster Crowell, Mem. Am. Soc. C. E., sailed Wednesday last for Hayti, at the invitation of the Haytian government. Mr. Crowell is to investigate the possibilities of a system of railroads for local transportation, some of which roads are to connect with those

planned by the Dominican government, thus connecting the two political divisions of the Island. Heretofore the Haytian government have employed French engineers.

—Mr. Peter F. Degroot, who had been in the employ of the New York Central & Hudson River road for 42 years, died Oct. 12 in Newburg, in his sixty-second year. When 20 years of age he was employed on the survey for the line of the Hudson River Railroad. Since that time he has held various positions with the company. A few years ago Mr. Degroot was Freight Agent in New York. During the past three years he has been Ticket Agent at the Fishkill station.

—Mr. J. W. Bushnell, Chief Engineer of the Florida Central & Peninsular and of the Florida Railway & Navigation Co. since 1878, has resigned his position to become connected with the Boca Grande Co., which is engaged in phosphate mining at Fort Myers, Fla. Mr. Bushnell is about 40 years old, and has been in the railroad service since 1870. His first service was on the Wabash & Western. The Florida Central & Peninsular line from Orange Lake to Tampa was built under Mr. Bushnell's supervision.

—Mr. Abram S. Hull, who was for 34 years Master Mechanic of the Cumberland Valley road, died suddenly at his home in Chambersburg, Pa., last week. He was born in 1826, and learned the machinist's trade in the Cumberland Valley shops, of which his father was foreman. After seven years spent in various towns in the neighborhood, he again found employment in the railroad shops, and three years after this, in 1855, he was made Master Mechanic. This position Mr. Hull held continuously for a term of 34 years. A year ago he resigned, and was appointed to another position on the road. Mr. Hull was greatly respected and liked by all who knew him. He had much ability as a mechanic, and he had the faculty to impart his knowledge to his subordinates.

—Mr. John N. Faithorn, who was last week elected Chairman of the new Southwestern Railway & Steamship Association, is 38 years old, having been born in England March 21, 1852. He entered the railroad service with the Chicago & Alton in February, 1873, as entry clerk in the freight department, remaining in that department as clerk, secretary to the General Freight Agent, and chief clerk of the department until his resignation in September, 1882, to accept the position of Auditor of the Southwestern Freight Association. When the Western & Northwestern Freight Association was organized in 1885, he was made Commissioner. Later the association was reorganized as the Western & Northwestern division of the Western Freight Association, and Mr. Faithorn's title was made that of Chairman. His administration of the affairs of that association has been remarkably successful. He supplements his executive and judicial ability with a pleasing address, and leaves the Chicago association with the respect and esteem of every member. The gentlemen of the Western Freight Association are to give Mr. Faithorn a banquet at Chicago this (Friday) evening.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—C. E. Skidmore has been appointed Freight and Passenger Agent at Pueblo, Col., in place of C. M. Hicklin, and C. C. Carpenter has been appointed Freight and Passenger Agent at El Paso, Tex., to succeed Mr. Skidmore.

Atlantic & Danville.—The following appointments have been made by the Directors: Gen. Charles B. Peck having resigned the office of Vice-President and General Manager, R. M. Stuart-Wortley has been appointed Vice-President, and the office of General Manager abolished. R. M. Stuart-Wortley having resigned the office of Treasurer, Joseph Rosenbaum has been appointed General Auditor and Treasurer. C. R. Capron having resigned the office of General Freight and Passenger Agent, Charles H. Cromwell has been appointed Traffic Manager. G. M. Hughes has been appointed General Superintendent. The offices will be at Portsmouth, Va.

Baltimore & Ohio.—J. F. Foley, trainmaster of the Union Pacific Road at Omaha, has resigned to accept a position as Assistant Superintendent of this road, with headquarters at Newark, O.

Birmingham, Cahaba & Water Valley.—Thomas Worthington, of Birmingham, Ala., has been elected President of this projected road.

Cape Fear & Yadkin Valley.—The old Board of Directors was re-elected at the annual meeting with the exception of E. J. Lilly, Jr., who was elected to serve in the place of his father. The following are the Directors: Julius A. Gray and D. W. C. Benbow, Greensboro; John D. Williams, Fayetteville, N. C.; George W. Williams, Wilmington; K. M. Murchison, New York; Chas. P. Stokes, Richmond; W. A. Moore, Mt. Airy; W. A. Lash, Walnut Cove; D. J. M. Worth, Asheboro; J. Turner Morehead, Leaksville; R. T. Gray, Raleigh, and E. J Lilly, Jr., Fayetteville. The Directors re-elected Julius A. Gray, President, and John M. Rose, Secretary.

Central Vermont.—At the adjourned annual meeting of stockholders of the road in St. Albans, Vt., Oct. 15, these directors were elected: J. Gregory Smith, James R. Langdon, E. C. Smith, Joseph Hickson, B. A. Cheney, W. H. H. Bingham, Robert Wright.

Chesapeake & Ohio.—H. C. Boughton has been appointed Assistant Superintendent of the Cincinnati division of the road vice W. J. McKee, resigned. His office will be in Cincinnati.

Chicago, St. Paul & Kansas City.—Henry Cassidy has been appointed General Agent, Freight Department, for this company, with headquarters at Tacoma, Wash. George M. Kinsler, Jr., has been appointed Freight Agent in charge of the territory in Pennsylvania east of the line of the Northern Central road, Southern New Jersey, Maryland, Delaware and Virginia. His office is at 56 South Third street, Philadelphia.

Cleveland, Cincinnati, Chicago & St. Louis.—George W. Bates, of Andrews, who for 13 years has held the position of foreman of bridges and buildings on the Wabash, has resigned to accept a similar place on this road with headquarters at Crawfordsville, Ind.

Concord & Montreal.—At the annual meeting of the stockholders in Concord, N. H., Oct. 14, the following directors were elected: Frederick Smythe, Manchester; Benjamin A. Kimball, John A. White, S. S. Kimball and John H. Pearson, Concord; N. S. Clark and Walter M. Parker, Manchester; Alpha J. Pilsbury and Charles E. Tilton, Tilton; C. E. Morrison, Boston; L. C. Patte, Enfield; C. A. Buseil, Laconia; H. N. Burger, Vermont. The directors organized by electing the following officers: President, Frederick Smythe; Clerk, William M. Chase; Executive Committee, R. A. Kimball, Chairman, J. H. Pearson, C. A. Buseil.

Consolidated Railroad Company of Vermont.—At the annual meeting in St. Albans, Vt., this week J. Gregory Smith, James R. Langdon, E. C. Smith, Joseph Hickson, B. P. Cheney, W. H. H. Bingham and John Bell were elected directors.

Cumberland & Pennsylvania.—Charles F. Mayer has been re-elected President and Charles W. Keim Secretary of the road.

Detroit, Grand Haven & Milwaukee.—The Board of Directors elected at the annual meeting held at Detroit, Mich., Oct. 6, is:

Sir Joseph Hickson, John Pridgeon, Jr., Geo. Moore, A. B. Maynard, W. J. Spicer, Chas. Stiff, Joseph Hobson, Geo. Jerome and E. W. Meddaugh. Sir Joseph Hickson was elected President.

Escambia.—The following officers were elected at a recent meeting at Sullivan, Ala.: M. H. Sullivan, President; J. W. Black, Vice-President; W. A. S. Wheeler, General Manager; S. R. Sandford, Superintendent; J. J. Sullivan, Secretary and Treasurer.

Fort Worth & Denver City.—W. A. Ross has been appointed Auditor of this company, vice B. H. Calef, transferred.

Georgia Pacific.—J. W. Anderson, for a long time assistant to Chief Engineer A. Riccio, of this road, has been appointed to succeed Mr. Riccio, who has resigned to enter the service of another company.

I. R. Baer has been appointed Road Foreman of Engineers for the First District, with office at Birmingham, Ala.

Great Northern.—The postponed annual meeting of the stockholders was held in St. Paul, Oct. 14. The method of electing directors was changed. Heretofore the board of six has been elected annually. At this week's meeting the membership of the board was increased to nine and the nine elected were classified Three were elected for three years, three for two years and three for one year. The election resulted: Three years' term, J. J. Hill and W. P. Clough, of St. Paul, and Samuel Hill, of Minneapolis; two years, Sir George Stephen and Sir Donald A. Smith, of Montreal, and George Bliss, of New York; one year, M. D. Grover and Edward Sawyer, of St. Paul, and J. Kennedy Tod, of New York. The new members of the board are Messrs. Bliss, Tod and Sawyer.

Hudson Tunnel Co.—At the annual meeting held at 2 Nassau street, New York, the following directors were elected: William M. Force, Albert B. Gibbs, Henry S. White, Charles Sooysmith, Frank P. Abbot, Charles E. Welling and Edward R. Greene.

Kanawha & Michigan.—J. M. Ferris, General Manager of the Toledo & Ohio Central, has been appointed General Manager of the Kanawha & Michigan, and the officials of the Toledo & Ohio Central have been appointed to the same positions on the Kanawha & Michigan as are now held by them on the Toledo & Ohio Central.

Nelson Robinson, E. C. Homans, and J. W. Simpson, of New York, and Stevenson Burke and C. G. Hickox, of Cleveland have been elected directors of this road.

Kansas City, Ft. Scott & Memphis.—L. K. Spafford has been appointed Superintendent of bridges, buildings and water service on the line, with headquarters at Kansas City, Mo.

Lake Superior & Terminal.—At the annual meeting of the company, held at Hudson, Wis., recently, the following directors were elected: A. B. Plough, St. Paul & Duluth; W. P. Clough and A. L. Mohler, Great Northern; E. W. Winter, Chicago, St. Paul & Omaha; W. F. Fitch, Duluth, South Shore & Atlantic; W. S. Mellen, Northern Pacific; and the officers elected are: W. S. Mellen, President; A. L. Mohler, Vice-President; D. A. McKinley, St. Paul & Duluth, Secretary and Treasurer.

Lehigh Valley.—The following directors were elected at the last annual meeting: Elisha P. Wilbur, Charles Hartshorne, Robert H. Sayre, John B. Surrett, John R. Fanshawe, Henry S. Drinker, George C. Thomas, Eugene Delano, Wilson S. Bissell, William Stevenson, George M. Diven, Howard Elmer and Franklin C. Cornell.

Daniel Ulrich, formerly with the New York, Lake Erie & Western, and later with Ellsworth, Chapman & Co., has been appointed Resident Engineer, with headquarters at West Superior, Wis.

Little Falls & Southern.—The incorporators of this road are: Peter Berkey, W. D. Cornish, John A. Berkey, W. H. S. Wright and Chas. S. Bunker, of St. Paul, Minn.

New York, Lake Erie & Western.—E. T. Meister has been appointed Roadmaster of the Delaware division, the vacancy having been left unfilled since the resignation of Mr. Corbett several months ago. Mr. Meister was formerly division engineer.

New York & New England.—C. H. Goodrich has resigned the office of General Freight Agent of the Ohio & Northwestern, to accept a responsible position with this company.

New York, New Haven & Hartford.—The annual meeting of the road was held in New Haven, Conn., Oct. 17. In a total of over 100,000 votes cast, the following were unanimously elected to serve as directors for the ensuing year: G. N. Miller and Wilson G. Hunt, New York; E. H. Trowbridge, New Haven; Wm. D. Bishop and Nathaniel Wheeler, Bridgeport; Henry C. Robinson, Hartford; Edward M. Reed, Charles P. Clark and Joseph Park, New York; Chauncey M. Depew, New York; Henry S. Lee, Springfield, Mass.: W. E. Rockifeller, New York, and Leverett Brainard, Hartford.

Niagara River & Erie.—John King, S. M. Felton, Jr., George W. Quintard, Henry W. Sprague, Washington Bullard, G. F. Brownell and A. R. Macdonough were elected directors of the company at the annual meeting last week.

Northern Pacific.—M. H. Mills has been appointed Assistant Superintendent of the Montana division of the road, with headquarters at Livingston, Mont.

Ohio & Mississippi.—At the annual meeting of the road at Cincinnati, Ohio, Oct. 9, J. T. Barnard, William Libby and George F. Crane, the three members of the Board of Directors, whose terms expired, were re-elected. The Board of Directors re-elected the present officers of the company.

Philadelphia & Reading.—E. Mahler, Auditor of Passenger Traffic, has been appointed Purchasing Agent pro tem., vice H. C. Norton, resigned. Mr. Mahler was formerly Assistant Purchasing Agent of the company.

Potomac Valley.—The stockholders met at Baltimore, Md., Oct. 15, and elected the following directors: John M. Hood, William A. Boyd, W. T. Hassett, Victor Cushwell, James Findlay, S. D. Schmacker and Robert Biggs.

Richmond & Danville.—C. Lesley West, foreman of the railroad shops at Salisbury, N. C., has been appointed foreman of the company's shops at North Danville, vice Charles W. Lee, appointed Master Mechanic, with office at Salisbury.

M. C. Figg has been appointed Assistant Auditor of this company, with office at Washington, D. C.

St. Paul & Duluth.—The annual meeting of the stockholders of the company was held in St. Paul, Oct. 9. The old board of directors were re-elected, as follows: R. B. Dodson, W. C. Tuckerman, William H. Bliss, Clarence S. Day, James Smith, Jr., E. W. Peel, R. S. Hayes, Thomas Denny, A. H. Stevens. These selected the following officers: R. S. Hayes, President, New York; William H. Bliss, Vice-President and General Solicitor, St. Paul; M. G. Haven, Jr., Secretary and Treasurer, New York; W. H. Coleman, Assistant Secretary and Local Treasurer, St. Paul; J. A. Hiltner, Assistant Secretary, New York; Julien T. Davies, Counsel, New York.

Union Pacific.—James M. Barr, Superintendent of the Nebraska Division, has resigned and has been succeeded by Robert Blickensderfer, who occupied the position two years ago.

RAILROAD CONSTRUCTION.

Incorporations, Surveys, Etc.

Atlantic & Gulf.—The next Florida legislature will be asked to incorporate this company to build a road from St. John's County across the state to a point on the Gulf of Mexico in Lafayette County. James Shears, J. Maxwell Tilden, J. L. Davis and H. R. B. Tilden apply for the charter.

Black Hills & Fort Pierre.—The survey is in progress for a branch to Galena, S. D. The grading will begin as soon as the survey has been made. The Galena and Bald Mountain and Ruby Basin Branch of the road will be completed shortly. These branches are being built for the purpose of hauling ore from the mines.

Broadway & West Virginia.—This company proposes to build a road from Broadway, Va., to the West Virginia line, and from Broadway via New Market and Luray to Acquia Creek.

Burlington & Missouri River.—The extension to Deadwood, S. D., which begins near Edgemont junction, on the Cheyenne River, about 25 miles north of the Nebraska state line, has been finished to Custer, about 50 miles south of the northern terminus. The road is an extension of the Grand Island & Wyoming Central, and will be about 107 miles long. The grading has been in progress since April and the tracklaying was begun in the latter part of May.

Caldwell.—C. W. Leavitt, of New York, has been given the contract to build the new road from Caldwell to a connection with the New York & Greenwood Lake roads at Great Notch, N. J. The distance is four miles. The contract calls for the completion of the work by next spring, when the notes given for its construction will fall due. Twenty-five thousand dollars has been expended for ties, rails and material for one bridge. Temporary sheds for the occupancy of laborers are being erected preparatory to commencing work.

Charleston, Sumter & Northern.—The company has laid the track about four miles southward from Bennettsville, S. C., and most of the grading and trestling to the Pee Dee River is finished. Work is also in progress north from Sumter.

Clarendon & Pittsford.—An extension of this road is being built from Clarendon to connect with the Bennington & Rutland, at Rutland, Vt., a distance of two miles. A good deal of the work has been done. The bridge near Rutland has been commenced.

Decatur, Chesapeake & New Orleans.—For some months past work has been progressing on this road. The track was overhauled through Lincoln County, Tenn., and bridges repaired. Several construction trains were put to work in Alabama and in Bedford County, Tenn. The citizens along the line have been furnishing teams and hands in great quantities, expecting the road to be able to meet its obligations. This it has failed to do, and all property belonging to the road and much of the contractors' material have been attached. The road cannot be totally abandoned without an absolute loss to its projectors. It may be sold to another road.

Delaware, Lackawanna & Western.—The tracklaying on the extension of the Passaic and Delaware branch from Bernardsville to Gladstone, N. J., was completed last Saturday. The extension is eight miles long. The maximum grade is 60 ft. per mile, and the maximum curve is 5½ degrees. There are several steel bridges on the extension, with spans varying in length from 50 ft. to 120 ft. The only work remaining to be done is the surfacing of three miles of road.

Escambia.—This road will soon be put in operation from Sullivan Station, on the Mobile & Montgomery Division of the Louisville & Nashville, to Monroeville. Of this distance 17 miles has been completed. The balance will be pushed through at once.

Evansville & Richmond.—The tracklaying on the extension to Westport, Ind., from Sand Creek, to which point the line was completed last year, was finished Oct. 7. The distance is 19 miles; and from Elnora, 101 miles. Connection is made at Westport with the Cleveland, Cincinnati, Chicago & St. Louis, and the tracks of that road are used to Rushville, Ind., the southern terminus of the Cincinnati, Wabash & Michigan, which is controlled in the same interest as the Evansville & Richmond.

Fairhaven & Southern.—The track has been laid beyond Bridge No. 4 for about five miles. The work will be delayed here by the bridge, which will be 700 ft. long. Most of the piles are already driven. A large force of men is employed on all the bridges and trestles along the line. A ship loaded with steel for the New Westminster Southern is daily expected to arrive at New Westminster. The construction trains are hauling gravel so that the line will be ballasted when the track is laid,

Fort Wayne, Terre Haute & Southwestern.—This road is projected to extend diagonally across the state of Indiana, from Fort Wayne southwesterly to Terre Haute and through Illinois. The charter was filed in Indiana last week. The capital stock is $4,000,000, of which $40,000 has been subscribed.

Fort Worth & Rio Grande.—The bridge over the Leon River on the extension from Dublin to Comanche, Tex., 22 miles, has delayed the tracklaying, which has reached the river, but the work will soon be pushed south to Comanche, which will be the terminus until the route for the extension beyond that point has been decided on. The work will probably not be resumed until next spring.

Franklin & Tilton.—The tracklaying was commenced on this road between Franklin and Tilton, N. H., four miles, on Oct. 14. The road is to be built from a point on the Northern road, 1¼ miles south of Franklin station to the Concord & Montreal road at Tilton, 4.93 miles. The line is being built jointly by the Boston & Maine and the Concord & Montreal. The grading has been completed and most of the masonry. About 70 men are employed on this latter work. There is a maximum grade of 82 ft. per mile and the maximum curve is eight degrees. Contractors for grading are Moulton, O'Mahoney & Trumbull, of Lawrence, Mass; for masonry, J. W. Buswell, Salisbury, Mass., and for tracklaying, Caldwell & Varnum. F. W. Bateman, Franklin Falls, N. H., is Chief Engineer.

Frederick & Monocacy Valley.—This road is to extend from Frederick northwesterly about 13 miles through Montonqua Springs and Lewiston to Catoctin. The charter has been procured in Maryland, and the company organized with a capital stock of $100,000. C. L. Hartsock, of Frederick, is one of the directors.

Fremont, Elkhorn & Missouri River.—The tunnel, 2,079 ft. in length, including approaches, near Deadwood, S. D., on the branch from Whitewood, is now opened, and about Nov. 1 the first train will enter Deadwood over that road.

Great Falls & Canada.—Trains have run over the entire length of this road, from Great Falls, Mont., to Lethbridge, Alberta, 205 miles, of which 135 miles is in Montana. The connections are the Great Northern at Great Falls, and at Lethbridge the Alberta road. The last rail was laid Oct. 1. The line will be formally opened this week, but the movement of coal from the Alberta mines to the smelters about Great Falls has already begun.

Great Northern.—The track is being laid on the branch between Cavalier and Grafton, N. Dak., about 16 miles, which was graded last year. Two miles of track is being laid a day, so that the work will be finished shortly.

Gulf, Colorado & Santa Fe.—The company is reported to be surveying an extension of its road from Conroe, Tex.

Harold.—A road has been recently built between Brewton and Harold, Ala., five miles, by the Harold Mill Co. The principal business of the road will be in carrying the lumber to the main line of the Louisville & Nashville from the Harold mill. Some freight business will also be done for mills located further up the river, shortening their present haul by wagon about five miles.

Herkimer, Newport & Poland.—The New York parties who recently secured an option on this road have carried out their agreement to pay 50 per cent. of the amount of the capital stock of the company for control of its property. The road passed into the hands of the new company this month. The survey of the route to Morehouse Lake, in the North Woods, is being pushed rapidly, and the construction of the extension from Poland northeast into the lumber region and the lakes will be commenced as soon as practicable. The line is about 10 miles long. The right of way has not yet been negotiated, but doubtless will be very soon. The old road is a narrow gauge, and is to be changed to standard gauge. It connects with the New York Central & Hudson River road at Herkimer.

Highland & Suburban.—This company has filed its articles of association with the Secretary of State in Indiana. The capital stock is placed at $100,000. The road is to build a short line at New Albany, Ind.

Kansas City, Nevada & Fort Smith.—Work has been commenced on the tracklaying at Grand View Station, 14 miles south of Kansas City, Mo., toward Amoret, a distance of about 50 miles. The Kansas City & Southern will be used for the present as an entrance to Kansas City from Grand View.

Kewaunee, Green Bay & Western.—The surveyors reached Green Bay, Wis., from Kewaunee last week. The route surveyed is about 25 miles long, and has easy grades. Kewaunee is on Lake Michigan, and has a good harbor. The contracts will probably be let this winter, and some of the clearing done, so that grading may begin in the spring. W. J. Abrams, of Green Bay, is President.

Lancaster & Hamden.—E. P. Buell & Co., of Lancaster, O., who have undertaken to build this road from the Cincinnati & Muskingum Valley junction to the Ohio River, have succeeded in negotiating the bonds of the road, and funds are now ready to push the work rapidly to completion. The contractors are to complete the main line and branch, 75 miles, by July 1 next.

Lehigh Valley.—The company is now operating its new line into the coal fields at Pottsville, Pa., the Schuylkill & Lehigh Valley. The road is 31 miles long and extends from Bowmans, south of Mauch Chunk, southwesterly to Schuylkill Haven, Pa.

Thomas Rickert, of Pottsville, Pa., Charles McFadden, of Philadelphia, and Thomas Collins, of Bellefonte, Pa., have each been awarded a contract for the construction of ten miles of new road for the Geneva & Van Ettenville road. The new line of road which is to be constructed lies along Seneca Lake in New York state from Van Ettenville northerly to Geneva, on the Buffalo & Geneva.

Little Falls & Southern.—The company has filed articles of incorporation at St. Paul for the building of a road from Little Falls through southern Minnesota to the Iowa line in Jackson County. The incorporators include John A. Berkey, W. H. S. Wright and Charles A. Bunker, all of St. Paul.

Massawippi Junction.—The clearing is in progress on this road, which is to be built from Coaticook, on the Grand Trunk, westerly about 15 miles to Ayers Flat, Que., for which the company has a government subsidy of $3,200 per mile.

Milwaukee, Lake Shore & Western.—A contract for extending the road from a point northwest of Interior, Mich., to a junction with the Duluth, South Shore & Atlantic at St. Collins has been let to Henry & Balch, of Minneapolis. The distance is about 13 miles.

Missouri, Kansas & Texas.—The Sherman, Denison, & Dallas branch, which has been built the past summer, will be put in operation this week from Denison south to Sherman, Tex., about 10 miles. It is proposed to extend the road south about 63 miles further to Dallas, but grading will not be commenced this year.

Missouri Pacific.—The grading on the new line from Union, Neb., north to a connection with the line of the Burlington & Missouri River road entering Omaha from the south, has been completed through Cass County, on the south side of the Platte River to near Murray. The work in Sarpy County has not progressed as far as in the former county. The ridge of the Burlington & Missouri across the Platte River will be used. The two lines will be parallel in Sarpy County for some distance.

The contracts are said to have been awarded for building the extension of the Warren branch of the St. Louis, Iron Mountain & Southern, from its present terminus at Warren westerly to Camden, Ark., about 45 miles. Arrangements are reported to have been made for the trains of this road to cross the St. Louis, Arkansas & Texas bridge on the Ouachita River, just north of Camden, to avoid the long delay in the construction of a bridge at that point.

Monterey & Mexican Gulf.—The main line has been completed to Victoria, about 256 miles south of Monterey, Mex., and the first train over the road to that point was run last Sunday. Tampico, the southern terminus, is about 135 miles south of Victoria.

Nashville, Chattanooga & St. Louis.—The contractors on the Tennessee & Cocsa extension, Allison, Shafer & Co., of Chattanooga, Tenn., have about 300 men on the grading, which is being pushed rapidly from Littleton, Ala. The present contract is for 23 miles to a point 2½ miles from Guntersville. This section is to be completed May 1, 1891. Investigations are now being made for best point to cross Tennessee River near Guntersville. The extension has been located through Albertville and Guntersville to Deposit. North of the latter point the route is undetermined, but it will tap the Huntsville branch either at Bell Factory or at Huntsville. The total length is 76 miles. That part from Gadsden to Littleton is already in operation.

The grading on the Pikeville extension is completed on about 16 miles, but this is not in one section. This part of the work will be finished in a few weeks. The track has been laid for nine miles, and the extension will probably be opened to Pikeville, Tenn., 20 miles from Dunlap, by Nov. 10. R. T. Creighton & Co. are the contractors.

New Roads.—A new railroad, to be owned and operated by Henry Sherry, is in course of construction from a point on the Wisconsin Central two miles below Mellen, Wis., to a lumber mill at Bladder Lake, a distance of seven miles. S. C. Knowles, A. A. McRhee and L. E. Winterhalter are the contractors. They have a force of about 500 men employed, and expect to have the road finished before cold weather.

A new railroad is projected from the West Shore line at Saugerties, N. Y., to the Hotel Kaaterskill, in the Catskill Mountains. Engineers are now engaged upon the survey in the mountains.

A narrow gauge railroad is to be constructed between St. Joseph, La., and New Light on the Tensas River.

Some one in New York is reported as being willing to advance $70,000 to complete a road from Cortland to Norwich, N. Y., by way of McGrawville, Solon, Cincinnatus, Pitcher and Otselic. The road has been graded most of the way to Cincinnatus, and some of the bridges are built. First mortgage bonds will be issued for this advance. It is thought that this amount will build and equip the road. The right of way must be secured, and the old company is to transfer all its right and title to the new company.

Haines Bros., of Kinderhook, N. Y., who have just finished the Hamilton & Kingston road in Missouri, propose to construct this road from Belleville, northwest to Ypsilanti and Ann Arbor, Mich., about 15 miles. They have a franchise for the construction of the line between Ann Arbor and Ypsilanti, and half way between Ypsilanti and Belleville. Right of way into Ann Arbor has been granted the company. The contract for the portion of the road between Ann Arbor and Ypsilanti has been let to Judson Kingsley, of Troy, N. Y., and work has been commenced. It is expected that the expense of the road will exceed $100,000. J. M. Wallace and R. W. Hemphill, of Ypsilanti, are incorporators.

Norfolk & Western.—The contract for the "Three States Tunnel," in Logan County, W. Va., on the Elkhorn extension, has been awarded to Mason, Locher & Co. This is a solid rock tunnel nearly a mile long, requiring about two years for its completion, and will be worked by an air compressor of 200 H. P. running 12 drills, six at each end, employing about 200 men.

Northern Pacific.—The track has been laid on 76 miles of the new line from Missoula, Mont., to the Idaho boundary line. The distance between these points is 103.5 miles. The line is an extension of the Northern Pacific & Montana, and leaves the main line of the Northern Pacific at Desmet, following the north side of the Missoula River some 15 miles, then the south side to the 71st mile, at the mouth of the St. Regis River, thence up that river to St. Regis Pass. The contractors, Woods, Larson & Co., will complete the work by Jan. 1. The maximum grade is 2.2 per cent., and curves 14 degrees on permanent line. Temporary overhead line at St. Regis Pass has 4 per cent. grades. The Missoula River bridge has two 150-ft. and two 100-ft. spans. The Fish and Rock creeks trestles are over 100 ft. high. There is only one tunnel, 650 ft. long. The whole work is rather difficult. The same contractors are building the line of the Cœur d'Alene Railway & Navigation Co. from Mullan to St. Regis, 11 miles.

Philadelphia, Harrisburg & Pittsburgh.—At a meeting of stockholders in Philadelphia this week, it was decided to issue $2,000,000 five per cent. 25-year first mortgage bonds. This new corporation is composed of the short lines of the Philadelphia & Reading Railroad east and west of Harrisburg, Pa., and includes the Harrisburg Terminal Co. The bonds will be guaranteed, principal and interest, by the Reading Railroad, which owns all the stock.

The work on this road at Harrisburg, Pa., is being pushed forward rapidly. All the stone work on the piers crossing the Pennsylvania Railroad and its canal on the east bank of the river, and of those crossing the Susquehanna will be finished this week. The superstructure over the Pennsylvania tracks, and canal is finished to Second street, and the engineers are now erecting the viaduct from that point to the east bank of the river. When that is done they will begin on the river spans. The contracts called for the completion of this work by Nov. 10, but some difficulty has been experienced in getting the iron work from manufactures, which will probably delay its completion. The bridge consists of 23 spans of about 180 ft. each—a total of 3,680 ft.

Philadelphia & Reading.—The company has decided to double track the Plymouth road from Oreland to Conshohocken, Pa., a distance of about 10 miles, for the purpose of running through freight from the Schuylkill Valley to New York and points in the East. A "Y" will be placed at Oreland and Jenkintown, and additional tracks will be laid to accommodate coal trains. The coal traffic from the Schuylkill Valley has lately interfered greatly with the passenger traffic between Wayne Junction and Jenkintown. At present all freight from the Schuylkill Valley consigned to New York and other eastern points is shipped by way of Belmont and Fair Hill Junction to Jenkintown, thence via Bound Brook. The new route will shorten the haul several miles, and divert much freight from the tracks between Jenkintown and Philadelphia, which are now needed for passenger service.

Potomac, Blackwater & Greenbriar.—A charter has been issued in West Virginia to this company, which proposes to build a road from Romney, Hampshire County, West Va., along the south branch of the Potomac River to Peterburg, Grant County, thence along the north fork of South Branch River to a point where the counties of Pocahontas, Pendleton and Randolph meet, and thence by three separate lines through the ore and lumber region, one passing through Greenbriar and White Sulphur Springs. Three other branches are also projected. The capital stock is $2,000,000.

Prescott & Northwestern.—Articles of incorporation of the company were filed at Little Rock, Ark., Oct. 7. Its capital stock is $125,000. The incorporators propose to build a road 24 miles in length northwest from Prescott, through Nevada, Hempstead and Pike counties. The incorporators are: W. B. Waller, James P. Copeland, W. V. Tompkins and R. L. Powers, of Prescott, Ariz.

Reidsville.—This company has been organized to build a road connecting Reidsville, in Tatnall county, Ga., with the Savannah & Western. The connection is to be made at or near the 58 mile post in Tatnall county, making the road about six miles long.

Roanoke & Southern.—Ground was broken at Roanoke, Va., Oct. 14, in presence of a large crowd. This is on the division between Roanoke and Martinsville. From the latter point the work has been in progress some time. The distance is 57 miles.

St. Joseph, Tarkio & Northwestern.—The corps of surveyors are making good progress with the preliminary survey of the road from Savannah to Tarkio, Mo. Some heavy work has been encountered. Although some of the fills will be very high and a few cuts will be comparatively deep, no rock work has been met with. The line will be about 45 miles long from Savannah northwest to Tarkio. It will be operated by the Chicago, St. Paul & Kansas City, with which it will connect near Savannah.

St. Louis, Kennett & Southern.—The company has begun tracklaying at Campbell, Mo. The connection with the St. Louis, Arkansas & Texas has been put in and a large force of men is pushing the work through. The grade is completed to Kennett, Dunklin County, 29 miles south of Campbell, and ready for the ties and rails. Timber men are making arrangements to put in several saw and stave mills along the line. The road will be completed to Kennett by Nov. 1.

Southern Pacific.—Messrs. Bays & Jeffrey, have the contract for the work in the Cow Creek cañon, in Douglass County, Or. This work is being pushed forward as rapidly as possible, the great difficulty being to get men enough to prosecute the work vigorously. As new bridge across Cow Creek. The new road will soon as the roadbed is ready the company will put in its be practically out of the reach of damage from high water, from which the road has suffered in Southern Oregon.

Work is to begin soon on the cut-off between Comstock and Shumla, Tex., 16 miles, on the Galveston, Harrisburg & San Antonio, in the western part of Texas. The present line is via Painted Cave, but this route will be abandoned and a new route built, which will be six miles shorter. A large bridge will be erected across the Pecos River.

Stark & Sampson City.—The company has been organized to build a road from Stark to Sampson City, in Bradford County, Fla., about five miles. Application will be made to the next legislature for articles of incorporation. Comer L. Peek, James S. Bailey and John L. Gaskins, of Stark, are interested.

Union Pacific.—In a recent interview in San Francisco, Cal., Mr. V. G. Bogue, the Chief Engineer, is reported as follows: The Union Pacific has made surveys into both Northern and Southern California, but, as far as I know, extensions into the state have not been decided upon. The surveys into Northern California were completed some two years ago. The surveys into the southern part of the state were made recently. Three surveys were run, all from Pioche, Nev., southward. One runs to Homer and another to Ludlow, points on the Atlantic & Pacific road. The third survey runs to a point on the Southern Pacific road. All of those surveys were made to furnish to the directors of the company information about the state. At the present time the company is building about 555 miles of new road. The extension from Milford, Utah, to Pioche, Nev., a distance of 145 miles, will be completed by Feb. 1, 1891. Another of our important new roads is the one from Portland to Seattle.

H. V. Gates, Resident Engineer, states the forces on the Puget Sound extension are being concentrated on the low lands along the Columbia and Cowlitz rivers, where the work is being rushed. There are some heavy fills to be made in these low lands, which must be completed and the track laid before high water next spring. The greater part of the men are at work between Vancouver and Centralia, but some long, heavy embankments are being built on the low lands beyond Centralia.

Utah Central.—The company has let the contracts for extending the road 25 miles from Park City to Moon's Mill, Utah, to William Holt of Big Cottonwood, Simpson & Thorn of Springville, and W. V. Black of Deseret, Utah. The prices paid will be 10 cents per cubic yard for common earthwork, 20 cents for soft gravel and 40 cents for hard gravel and rock.

Western Counties.—Work on the Digby and Annapolis branch is being pushed rapidly forward. Some 12 miles of rails are already laid, and a construction train is running over that part of the road. The contractors are making every effort to get it finished this fall.

Wilmington, Onslow & East Carolina.—F. L. Pitman, Chief Engineer of the road, has a corps of surveyors running a preliminary line from Jacksonville, Onslow County, to the city of New Berne, N. C. The distance is about 38 miles. About 34 miles of track ha now been laid, extending from Wilmington to the Golden Place, Onslow County.

Wilmington & Weldon.—The track on the extension of the Scotland Neck branch from Greenville south to Kinston, N. C., has been laid to the latter town, on the Atlantic & North Carolina, 28 miles from Greenville, and 89 from Weldon.

Winona & Southwestern.—The track has been laid for distance of 13 miles from Utica, to a point three miles west of Dover, Minn., and 48 miles from Winona. It is expected to complete both grading and tracklaying to Osage, Ia., about 120 miles from Winona, this fall. Work is now in progress on the 84 miles from Utica, through St. Charles, Stewartville, Spring Valley, and Leroy, Minn., and McIntire, Iowa, to Osage. D. Galligan, of Lanesboro, Minn., is the contractor for grading between Utica and Stewartville, 33 miles, and D. Leary & Son, of St. Paul, Minn., are the contractors for bridges. E. C. Long & Co. of St. Paul, Minn., have the contract from Stewartville to the junction of the Chicago, St. Paul & Kansas City at McIntire, a distance of 34 miles, and W. D. Van Norman, of Minneapolis, the contract for bridges. Kimball & McNamara, of Sioux City, have the contract for both grading and bridging from McIntire to Osage.

GENERAL RAILROAD NEWS.

Atchison, Topeka & Santa Fe.—The gross earnings, operating expenses (exclusive of taxes and rentals), and net earnings of the company and auxiliary lines for the month of August, 1890, were:

	Gross earnings.	Operating expenses.	Net earnings.	Oper. m'lge.
Roads owned and controlled	$2,763,615	$1,869,259	$894,355	6,528
Roads jointly owned with other Cos.: Atchison Co.'s one-half	130,477	131,949 def.	1,471	582
Total	$2,894,092	$2,001,208	$892,884	7,110
St. Louis & San Francisco:				
Roads owned and controlled	$607,443	$330,038	$277,404	1,329
Roads jointly owned with Atchison Co.; Frisco Co.'s one-half	127,363	124,862	2,502	526
Total	$734,806	$454,900	$279,906	1,855
Aggregate—both systems	$3,628,898	$2,456,108	$1,172,790	8,966

The comparative statement for all lines is as below:

Atchison system—	Gross earn.	Net earn.	Per mile Gross earn.	Per mile Net earn.	Mileage.
August, 1890	$2,894,092.00	$892,884.00	$467.04	$125.58	7,110
August, 1889	2,492,451.00	841,456.00	350,47	118,32	7,112
Increase	401,641.09	51,427.00	56.57	726.00	
'Frisco system—					
August, 1890	754,896.48	279,906.51	396.04	150.85	1,855
August, 1889	685,902.45	275,939.11	369.68	148.72	1,855
Increase	48,904.03	3,967.40	26.33	2.14	
General system—					
August, 1890	3,628,898.78	1,172,790.47	404.76	130.81	8,965
August, 1889	3,178,353.57	1,117,395.53	354.45	124.61	8,965
Increase	450,545.21	55,394.94	50.31	6.20	

Floods caused $21,000 extra charges to operating expenses on the New Mexico & Arizona and Sonora roads above ordinary.

Baltimore & Ohio.—The following statement of the earnings and expenses for September, 1890, compared with September, 1889, has been published, the 1890 earnings being approximated: Earnings, 1889, $2,079,237, and 1890, $2,196,513, an increase of $117,275; expenses, 1889, $1,255,371, and 1890, $1,431,088, an increase of $175,717; net, 1889, $823,866, and 1890, $765,425, a decrease of $58,441. Earnings and expenses for the fiscal year ended Sept. 30, 1890, compared with the fiscal year ended Sept. 30, 1889, were: Earnings, 1889 $21,303,001 and $24,392,881, an increase of $3,089,880; expenses, 1889, $14,810,844, and 1890, $17,014,030, an increase of $2,203,216; net, 1889, $6,492,157, and 1890, $7,378,821, an increase of $886,664.

Bedford & Bridgeport.—This road, which extends from Mount Dallas, Pa., the terminus of the Huntingdon & Broad Top Road, to the Maryland line, is to be sold under a foreclosure of a $700,000 mortgage held by the Pennsylvania. The road is now operated by the Pennsylvania under lease, and it is supposed that the foreclosure is the first step in the Pennsylvania Company's project to build connecting links for another through line from Harrisburg to Pittsburgh.

Chicago & Erie.—The injunction case of the Wabash company against this road to restrain the latter from refusing to allow the Niagara Falls Short Line trains to run over its tracks, between Laketon Juncton and Hammond, Ind., was argued last week in the Circuit Court at Wabash, Ind. The Wabash attorneys argued that while the Wabash practically had no right to run its trains over the Chicago & Erie tracks under the agreement made June 1, 1887, after the termination of the receivership, the Chicago & Erie by handling Wabash trains after Sept. 1 continued the agreement, which it could not break except upon giving reasonable notice. Pending the decision the injunction was continued.

Cleveland, Cincinnati, Chicago & St. Louis.—The first annual report of the directors of the consolidated company gives the following figures for the fiscal year ending June 30: Gross earnings, $12,384,779; operating expenses, $7,981,243; net earnings, $4,403,536; fixed charges, $2,920,559; balance, $1,482,977; dividend of five per cent. on preferred stock, $500,000, and dividend of four per cent. on common stock, $820,000; surplus, $162,977. In the year stated $1,903,658 was expended for rolling stock and additional real estate and buildings; $1,388,000 of that amount for new freight cars. During the past year $186,191 was paid out for car service. It is expected that the transfer of the Cincinnati, Sandusky & Cleveland road will be made some time next month. The consolidation of the two roads cannot under the laws of the state of Ohio be accomplished directly. It is proposed that the Cincinnati, Sandusky & Cleveland road be leased to the one company, and then its stock may be exchanged for the stock of the lessee.

Concord & Montreal.—The first report of the directors of the company shows earnings from April, 1889, to June 30, 1890, as follows: Local freight service, $1,102,027; through freight service, $486,322; local passenger service, $814,209; through passenger service, $242,780; miscellaneous, $130,263; total, $2,775,601. General expenses, $1,833,321; new equipments, $89,482; rentals, $66,527; interest, $107,638; taxes, $94,018; renewals, $53,357; improvements, $119,271; balance of earnings, $411,916; surplus, $65.

Erie & Pittsburgh.—This company has given the Union Trust Co. of New York a mortgage for $4,500,000, which was placed on record in Erie, Pa., last week. The mortgage is given to satisfy another of over $3,000,000 and to raise funds for further improvements in docks and ore and coal handling facilities in Erie, Pa.

Houston & Texas Central.—Another injunction will cause the postponement of the reorganization of this Texas Central Railroad, which was to have been completed Oct. 15 by the issue of the bonds and stock of the new company. The minority stockholders have obtained from Judge Bryant, of Texas, an order restraining the Central Trust Company from issuing the new securities. The injunction is returnable Nov. 3. On Nov. 1 the case will come before Judge Pardee, of the Eastern Circuit Court, in Texas, who will, in association with Judge Bryant, decide whether or not the injunction shall be made permanent.

Lackawanna & Southwestern.—This road is reported to have suspended entirely the running of trains. The company is a reorganization of the Lackawanna & Pittsburgh, and under its changed name it does not seem to have had a less precarious existence than under the old. It operates about 144 miles of road, from Olean to Bath, N. Y., 94 miles, Olean to Angelica, 40 miles, and a 10-mile branch to Hornellsville Junction. Part of this is narrow gauge.

Missouri, Kansas & Texas.—The actual gross earnings of the company for the nine months ending Sept. 30 were $5,807,512, against $5,304,186 for the same period of 1889, an increase of $503,325.39. The actual earnings for the months of October, November and December last year were $2,440,298, and estimating these three months of 1890 at the same figures, gives the gross for the present year at $8,337,810, an increase as $585,945. In commenting on these figures, President Enos says that the actual figures for the last quarter of 1890 are likely to be better than estimated, and an increase of $150,000 for these last three months of the year can be expected. By Jan. 1 over $3,000,000 will have gone into the property as betterments. Of this, $800,000 has been expended in replacing wooden bridges with iron bridges; there have been 30 new locomotives bought, 1,000 new cars of different kinds purchased, and most of the old cars have been reconstructed. There have also been 3,000,000 new ties laid on the road, more than 300 miles of the roadbed has been ballasted with gravel or stone, and 300 miles of 63-lb. rails have been laid.

There was deposited in the office of Secretary of State at Austin, Oct. 8, two mortgages, first and second, of the company under the reorganization. Both mortgages aggregate $60,000,000. The first mortgage bonds are to date from June 1 last, draw four per cent. interest and amount to $40,000,000, payable in 100 years. The mortgage covers all lines of the road, including the short lines in Texas, such as the Taylor, Bastrop & Houston, and the branch from San Marcos to Lockhart.

New York Central & Hudson River.—The gross earnings of the company for September, 1890, were $3,215,886 against $3,392,298.40 in 1889, a decrease of $176,412. For the quarter ending Sept. 30, 1890, the gross earnings were $9,064,.34, and in 1889 $9,745,201, a decrease of $680,966.85.

Union Pacific.—The August statement of the entire system shows gross earnings $3,984,368, an increase of $64,549; net earnings $1,477,075, a decrease of $281,551. For the eight months ending Aug. 31: Gross earnings, $28,649,639, an increase of $3,650,520; net, $9,147,077, a decrease of $42,826.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, Oct. 15, 1890.

The various associations are holding their regular meetings this week, which meetings are of unusual interest from the number of important topics to be considered. The presidents, members of the Interstate Commerce Railway Association, convened yesterday. In view of the promulgation of the circular letter of Chairman Walker, noticed briefly in my dispatch of last week, it was expected that the discussion of the present situation at this meeting would be unusually interesting, and that action in the line indicated in the circular might be looked for, but no decisive action could be taken because of the absence of lines not members of the association. Other meetings and conferences are to follow which will give opportunity for further discussion.

The Freight Committee of the Central Traffic Association met yesterday with a long list of subjects for consideration before them. It is reported that considerable uneasiness exists as to the eastbound freight situation and charges of cuts and manipulations continue to be freely made; but the meeting resulted in no definite action.

The Western Passenger Association held a meeting Oct. 9 to consider the question of reduced rates east from St. Louis, and an effort was made to have the Central Traffic Association join in a similar rate via Chicago, but without success.

The latest move in the effort to oust the Canadian Pacific from Chicago is the filing of a complaint by the Chicago & Erie in the Federal Court at Indianapolis asking for an injunction restraining the Wabash from using the tracks of the complainant between Hammond and Laketon Junction, Ind.

The Joint Rate Committee have issued a circular urging the lines to issue instructions to their agents to be more particular to note the original point of shipment, car number and initials on all manifests and transfer slips of carload shipments. This is for the purpose of remedying, if possible, a difficulty at present existing in identifying such shipments at destination when billed to "order notify" which have been transferred in shipment.

The Board of Apportionment for the southwestern eastbound freight traffic have issued orders to the Chicago, Milwaukee & St. Paul to divert 100 cars of freight to the Rock Island and 100 cars to the Chicago & Alton. It is reported that the Atchison is not complying rapidly enough with the orders of the Board and that it has been asked to increase its transfers more rapidly. Of some 1,600 cars ordered turned over by that road, it has as yet turned over only about 500. The proportions carried by the various lines east from Kansas City during the month up to the 11th were as follows: Chicago & Alton, 498 cars; Burlington, 702; Chicago, Milwaukee & St. Paul, 424; Rock Island, 256; Atchison, 1,208; Chicago, St. Paul & Kansas City, 141; Wabash, 301; Missouri Pacific, 365; Kansas City, Fort Scott & Memphis, 277 cars.

The counsel of the various lines made defendants in the complaint of the Eau Claire (Wis.) Board of Trade before the Interstate Commerce Commisson, alleging discrimination against Eau Claire in the matter of lumber differentials, held a meeting here Oct. 10, and all the lines agreed to ask the Commission for 20 days more time in order to give them a chance to further examine the matter. The differentials complained of are those known as the Bogue differentials, which have been in force for six years, giving general satisfaction. The whole question of the relative movement and rates on white and yellow pine lumber has been discussed time and again by the roads, and it is certain that if the Commission should order a reduction in the Eau Claire differential the Southern lines would at once revise and lower their rates from the yellow pine territory to the same relative basis as now, and it is hard to see how the situation would be in any way changed. It is stated that since these differentials have been in force the volume of lumber from Eau Claire has increased while that from Chicago has decreased.

Traffic Notes

The New England Board of Presidents, which has been in existence about a year and a half, has disbanded.

A New York paper says that the various trunk lines are now bidding for emigrant passenger business in New York City as actively as ever, each company having individual drummers, and the joint agency being a dead letter.

The Iowa Railroad Commission has received notification that the Illinois Central Railroad has put in effect the joint rate tariff prescribed by the Commission, and the Chicago, St. Paul & Kansas City has issued an order to the same effect.

The trunk line presidents met in New York on Thursday of last week and discussed eastbound rates, but were unable to take any definite action. The meeting formally approved the appointment of J. F. Goddard as chairman of the Association.

The Philadelphia Car Service Association, which began operations on Sept. 1, has produced the usual good results. Out of 45,500 freight cars received during September 39,500 were released inside of 48 hours. The Philadelphia & Reading has taken off four switching crews.

A new feature in eastbound traffic from the West this season is a large movement of apples from Kansas City, Independence and other points west of the Missouri River, several hundred carloads having been shipped prior to Oct. 3. It is alleged that rates to New York were secretly cut on this business.

St. Paul brokers are said to hold large quantities of tickets, which they are selling at $7, from St. Paul to Chicago. Many return portions of harvest excursion tickets have been handled by scalpers, and now straight tickets are coming from the same source. Not only is the Chicago business affected, but through traffic to Boston and New York; and the "Soo" line announces that it will reduce rates eastward $2 to $5.

Indictments were returned in Cleveland this week by the United States Grand Jury against the Cleveland, Canton & Southern and New York, Lake Erie & Western for violation of the Interstate Commerce law. The offense of the former consisted of not posting in its stations a notice of reduction of fare, and the charge against the Erie is that no bulletin giving the rates of fare to all points on its line is posted in the Cleveland station.

Settlement of the St. Louis Passenger Rate War.

The rate war between the Ohio & Mississippi and its connections east and west and the Big Four and its connections was ended Oct. 10. The terms of the agreement are: (1) The reduced rates from St. Louis east are to be taken off on Oct. 19; (2) the round-trip rates from St. Louis east beyond Cincinnati are to be taken off at once; (3) the round-trip rates from St. Louis to continue at the present reduced rate till Oct. 19, tickets to be sold daily, the limit decreased so as to expire Oct. 19.

Scarcity of Freight Cars in Iowa.

The autumnal lack of freight cars is beginning to be seriously felt on nearly all of the roads west of Chicago. Shippers are making numerous complaints, and a Chicago paper states that the Iowa Railroad Commissioners have served notice on the roads that they must provide more cars, reminding them that the law requires all the roads doing business in that state to provide the necessary cars. A lack of equipment cannot be accepted as an excuse for breaking the law.

East-bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, Oct. 11, amounted to 71,025 tons, against 71,823 tons during the preceding week, a decrease of 798 tons, and against 60,446 tons during the corresponding week of 1889, an increase of 10,579 tons. The proportions carried by each road were:

	W'k to Oct. 11. Tons.	W'k to Oct. 11. P. c.	W'k to Oct. 4. Tons.	W'k to Oct. 4. P. c.
Michigan Central	7,165	10.1	7,690	10.7
Wabash	3,389	4.7	3,097	4.3
Lake Shore & Michigan South.	11,363	16.0	12,432	17.3
Pitts., Ft. Wayne & Chicago	6,494	9.1	7,921	11.0
Chicago, St. Louis & Pitts	14,197	20.0	11,619	16.2
Baltimore & Ohio	2,944	4.1	3,712	5 2
Chicago & Grand Trunk	9,725	13.7	9,039	12.6
New York, Chic. & St. Louis	7,876	11.1	8,663	12.1
Chicago & Atlantic	7,962	11.2	7,650	10.6
Total	71,025	100.0	71,823	100 0

Of the above shipments 1,118 tons were flour, 28,974 tons grain, 2,463 tons millstuffs, 5,377 tons cured meats, 2,328 tons lard, 8,863 tons dressed beef, 1,440 tons butter, 1,643 tons hides, 295 tons wool, and 8,142 tons lumber. The three Vanderbilt lines carried 37.2 per cent., while the two Pennsylvania lines carried 29.1 per cent. of all the business.

During the week the lake lines carried but 37,507 tons, against 79,414 tons during the preceding week. Of the shipments 6,133 tons were flour and 24,226 tons grain.